Digitized by the Internet Archive
in 2010 with funding from
University of Toronto

http://www.archive.org/details/memoirs35harv

MEMOIRS

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY

AT

HARVARD COLLEGE.

VOL. XXXV.

CAMBRIDGE, MASS., U. S. A.
Printed for the Museum.
1907–1918.

149707
28/4/19

QL
1
H35
v.35

CONTENTS.

No. 1.— REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT.-COMMANDER L. M. GARRETT, U. S. N., COMMANDING. VIII. THE HYDROIDS. By SAMUEL F. CLARKE. 15 plates. February, 1907 1

No. 2.— REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING. IX.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT.-COMMANDER L. M. GARRETT, U. S. N., COMMANDING. X. THE BRACHYURA. By MARY J. RATHBUN. 9 plates. August, 1907 21

No. 3.— REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT.-COMMANDER L. M. GARRETT, U. S. N., COMMANDING. XXV. THE SHORE FISHES. By WILLIAM C. KENDALL AND LEWIS RADCLIFFE. 8 plates. April, 1912 75

No. 4.— REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING. XVI.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT.-COMMANDER L. M. GARRETT, U. S. N., COMMANDING. XXVII. THE SCHIZOPODA. By H. J. HANSEN. 12 plates. July, 1912 173

No. 5.— REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING. XIX. THE DOLABELLINAE. By F. M. MACFARLAND. 10 plates. September, 1918 297

Memoirs of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. XXXV. No. 1.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT.-COMMANDER L. M. GARRETT, U. S. N., COMMANDING.

VIII.

THE HYDROIDS.

By SAMUEL F. CLARKE.

WITH FIFTEEN PLATES.

[Published by permission of George M. Bowers, U. S. Commissioner of Fish and Fisheries.]

CAMBRIDGE, U. S. A.:
Printed for the Museum.
February, 1907.

TABLE OF CONTENTS.

	Page
Introduction	5
Pennaria pacifica, Pl. 1	6
Pennaria gibbosa, Pl. 2.	7
Pennaria tiarella, Pls. 3, 4	7
Campanularia (?) obliqua, Pl. 5, Figs. 1–4	9
Obelia striata, Pls. 6, 7	9
Obelia (?) sp., Pl. 5, Figs. 5–7	10
Campanulina denticulata, Pl. 8	12
Lafoea gracillima	13
Thuiaria tubuliformis, Pl. 9	14
Sertularella tropica, Pl. 10, Fig. 1–3, 3 b.	14
Zygophylax chazaliei, Pls. 11–13	15
Cladocarpus distomus, Pl. 14	17
Plumularia helleri, Pl. 15	18
Aglaophenia struthionides, Pl. 10, Fig. 4–6	18

THE HYDROIDS.

INTRODUCTION.

The collection of Hydroids made by Mr. Agassiz in the Eastern Pacific in 1904–1905 is a small one of twelve species, and some of these are represented by single specimens. All of them are from the tropics, four are from the shores of Perico Island in the Gulf of Panama, three are from stations near the Galapagos Islands, two are from stations off Aguja and Callao, Peru, and one, *Obelia striata*, was also collected in the open Pacific almost directly on the equator, some 1500 miles west of South America. Their names, localities, and bathymetrical distribution are shown in the accompanying table: —

	Station No.	Latitude.	Longitude W.	Depth.
Pennaria pacifica, sp. nov. . .	Perico Id.			
Campanularia obliqua, sp. nov. .	Perico Id.			
Obelia striata, sp. nov. . . .	4742	N. 0° 3.4′	117° 15.8′	Trawl 2320 "
Obelia striata, sp. nov. . . .	4657	S. 7 12.5	84 9.0	Tow 300 "
Obelia sp.	Perico Id.			
Campanulina denticulata, sp. nov.	4672	S. 13 11.6	78 18.3	2845 "
Lafoea gracillima	4642	S. 1 30.5	89 35.0	300 "
Thuiaria tubuliformis	Perico Id.			
Sertularella tropica	4647	S. 4 33	87 42.5	2005 "
Zygophylax chazaliei	4642	S. 1 30.5	89 35.0	300 "
Cladocarpus distomus, sp. nov. .	4630	N. 6 52.0	81 42.5	556 "
Plumularia helleri	4621	N. 6 36.0	81 44.0	581 "
Plumularia helleri	4622	N. 6 31.0	81 44.0	581 "
Aglaophenia struthionides . .	4643	S. 1 28.7	89 48.5	100 "

The most surprising fact about this collection is that from the 116 stations occupied on this expedition the hydroids are so small in amount and the species so few. From the shores of Perico Island, near the anchorage of the "Albatross," in the Bay of Panama, there are four species, and the remaining seven are from eight of the stations after leaving Panama. That leaves 112 stations showing no hydroid life. Of the eleven species, *Lafoea gracillima* is the most widely known, but it has hitherto been reported from northern waters only; Marktanner-Turneretscher 79° 5.4′ N.

Br., 61° 23.6′ W. L. Dr. Kepes; Yellow Sea, Dr. Swoboda; North Atlantic, Bonnevie; Coast of Maine, Verrill; Alaska, Clarke.

It is interesting to find that two of the species, *Thuiaria tubuliformis* and *Zygophylax chazaliei*, were known hitherto from the Atlantic side of the Isthmus of Panama only. In 1888 Mr. Alexander Agassiz discussed the resemblances of these two marine faunas, as shown especially by the results of his deep-sea dredgings, in his volumes on "Three Cruises of the Blake," page 157: "In fact, the deep-sea fauna of the Caribbean and of the Gulf of Mexico is far more closely related to that of the Pacific than to that of the Atlantic. Before the cretaceous period the Gulf of Mexico and the Caribbean were undoubtedly in freer communication with the Pacific than with the Atlantic Ocean; so that, notwithstanding the presence of a number of Atlantic types, the characteristic genera were common to the Pacific."

The label in the bottle with *Campanulina denticulata* records a depth of 2845 fathoms, something unusual, but not unequalled, for hydroids. Allman gives records of 2900 fathoms in the Pacific for *Stylactis vermicola*, and for *Monocaulis imperator*, collected by the "Challenger."

Pennaria pacifica, sp. nov.

Plate 1.

Troposome: — Hydrocaulus 20 to 35 mm. high, simple, black near the base, becoming horn color at the distal ends, divided by nodes into rather short internodes without annulations in the distal portion, with one, rarely two, in the basal part; pinnae arranged alternately, one from each node, originating below the internode, divided by nodes like the stem and with two or three annulations at the base; peduncles borne on the upper sides of the pinnae, one proximally to each node, tapering but slightly to the base, where there are two or three annulations. Hydranths with twelve to fourteen filiform tentacles, and when fully developed having about sixteen capitate tentacles, somewhat irregularly arranged.

Gonosome: — Not present.

Habitat: — Perico Island.

These specimens resemble *P. symmetrica*, but a careful comparison of the specimens of both species shows constant differences in the character and number of the annulations and in the shape of the peduncles, which makes it easy to recognize each kind. In *P. symmetrica* the annulations are more

numerous, three to seven usually, on each internode of the stem, sometimes nine, not in the form of simple rings, but saucer-shaped (see Pl. 2, fig. *3*), five to seven at the base of each pinna, and the same number at the base of each peduncle. The annular base of the peduncle is the narrowest part and is much compressed, making one of its transverse diameters much greater than the other. The hydranths are not very well preserved in either lot of specimens, and I discover no marked differences in those of equal size like the ones in terminal positions on the main stem and pinnae. As the stem and pinnae elongate, a new hydranth is formed just below the terminal, and as the terminal hydranth is the largest on the pinna, the largest and oldest is always next to the youngest and smallest, however many there may be on the pinna.

It is possible that when we have more material with the gonosomes of both these species, and we know their complete life histories, we can unite the two.

I have had an opportunity to study the original specimens of *Pennaria gibbosa* L. Agassiz from Key West. In studying *P. symmetrica* for description I considered it distinct from *P. gibbosa*, because of the gibbous shape of the hydranth, and the very slender, tapering, completely annulated character of the peduncle showing no compression at the base, in the description of *gibbosa*. In comparing the specimens of the two I find that the peduncles are alike in both and the hydranths of one are as gibbous as those of the the other (see Pl. 2, figs. *2* and *4*). The filiform tentacles are somewhat longer in *symmetrica* than in *gibbosa*, but that is a feature of slight value. *Pennaria symmetrica* Clarke becomes a synonym of *Pennaria gibbosa* Agassiz.

A fact of some importance in valuing the characters of the species of Pennaria is found in the changes produced by somewhat different environment even in localities close together. In examining specimens of *Pennaria tiarella* from Woods Hole, Mass., I was impressed with the differences between the specimens from the piles of the wharf and those growing on the long, slender, ribbon-like leaves of eelgrass (Zostera) near-by. Those from the eelgrass have stems much smaller at the base than at the distal ends, the latter often being twice the diameter of the basal part. (See Pl. 3, figs. *3*, *4*). In the specimens from the wharf the base of the stem is but slightly smaller than the distal end; the difference is obvious in one, while in the other it would not be seen without careful observation (see Pl 3, figs. *1*, *2*). The basal third or two thirds of the stem, in the specimens

from the Zostera, are black; the remainder is horn color. The stem in the wharf specimens is horn color throughout. The filiform tentacles in the Zostera specimens are longer than those of the wharf specimens. The swollen distal ends of the capitate tentacles are often larger than those of the wharf specimens. I find that Professor Hargitt[1] in 1900 called attention to certain differences in these two forms of *P. tiarella* at Woods Hole. He says that the form upon the eelgrass "matures with much greater rapidity and has apparently a much briefer period of activity, hardly covering more than about four or five weeks. It is further distinguished by a higher coloration of the colonies and of the medusae. Again, the medusae free themselves with much greater frequency and ease, and swim much more actively. The ova of the two forms likewise show the same difference of coloration, those of the [eelgrass] being a brighter orange and much more conspicuous, while those of the [wharf] are of a creamy white, with the slightest tint of dull pink."

From an examination of the capitate tentacles of many hydranths of *P. tiarella* I find no exception to a regular arrangement in verticils in the younger state, but in the fully developed hydranths with a larger number of capitate tentacles there appears an irregular arrangement, especially in the proximal region nearest to the filiform tentacles. (See Pl. 4.)

Hargitt has pointed out that Allman founded the genus Halocordyle on the untenable basis of a verticillate arrangement of the tentacles, separating *P. tiarella* on that ground from *P. gibbosa*, in which they are described as irregularly arranged. In addition to what I have said above in regard to the arrangement of the capitate tentacles in the young and old hydranths, I would call attention to Pl. 2 fig. 5, a camera lucida drawing from the type specimen of *P. gibbosa* which shows the distal capitate tentacles arranged in two verticils. Comparing this with the figures of *P. tiarella*, it seems probable that in both the distal capitate tentacles are the first to appear, the more distal row first of all, and that later a more or less irregular arrangement of the complete number obtains. These observations re-enforce the view expressed by Hargitt that the "intergradations in all degrees in species from different regions and from the same region" leave no basis for the genus Halocordyle.

[1] American Naturalist, 34, p. 387.

Campanularia (?) obliqua, sp. nov.

Plate 5, Figs. *1–4*.

Trophosome: — Hydrothecae with a full outline tapering but little toward the base, with a diaphragm on which rests the body of the hydranth; the margin has ten prominent teeth which do not point directly upward, but obliquely; the peduncles are annulated at the base and immediately below the hydrotheca, and in one of the specimens there are a few annulations about the middle of the peduncle. The hydrorhiza consists of simple creeping tubes.

Gonosome: — Not known.

Habitat: — On a sertularian from Perico Island.

This is a small creeping form with peduncles from 1 mm. to 1½ mm. in height. In the annulation of the peduncles, the shape and number of teeth, this species is like *C. gravieri* Billard.[1] It is distinguishable from the latter by the obliqueness of the teeth in *obliqua* and the crests of the teeth in *gravieri*.

This species is represented in the collection by a few specimens only, and the main reason for recognizing them as a species, aside from the marked peculiarity of the obliqueness of the teeth, is the hope that by calling attention to them they may be watched for in any future collections from the region of Perico Island.

Obelia striata, sp. nov.

Plates 6 and 7.

Trophosome: — Hydrocaulus rising from a creeping stolon, simple, clustered, eight to ten annulations at the base, seldom and very sparingly branched, annulated with numerous (12 to 16) rings immediately above the origin of each hydrotheca; five to eight annulations at the base of each hydrotheca. Hydrothecae pedunculate, alternately arranged, deeply campanulate, very hyaline, tapering to the base; a well-marked diaphragm defines a basal cavity; the margin has a crenated edge forming about fourteen to sixteen teeth which have well-developed crests projecting inward; the distal part is deeply fluted, producing a series of longitudinal striations that are about one third the length of the hydrothecae.

[1] Bulletin Muséum d'histoire naturelle, 1904, nº 7, p. 480.

Gonosome : — The gonothecae occur both on the hydrorhiza and on the hydrocaulus. They are sessile, or nearly so, nearly cylindrical in the distal half, tapering to the base, strongly curved, having a terminal opening in the centre of a diaphragm-like membrane. A somewhat unusual type of a young medusa with four main tentacles was found in one of the gonothecae (see Pl. 6, fig. 7).

Habitat : — Serial Number of Haul, 4742. Latitude, North, 0°.3.4′. Longitude, 117°. 15.8′ West. Trawl, 2320 fms.

As this colony was attached to a pteropod shell still containing its maker, it was probably taken in the tow.

This is a beautiful form, and because of its perfect freedom from other animals and plants and from all dirt, it is an especially favorable and enjoyable object for study. The most marked feature is the deep fluting of the distal portion of the hydrothecae, which is well shown in Pl. 7, fig. 4. Something of a transverse constriction occurs in some of the hydrothecae, always a little below the transverse median line ; it appears in some of the hydrothecae on each of several hydrocauli, as represented on Pl. 6. The size of the hydrothecae varies much, a few very small ones, the peduncles of which arise from the hydrorhiza, being only one half the length of the largest.

A second colony of what is apparently this same species was taken in the tow net in a surface haul at the locality recorded under serial number 4657, Latitude, South, 7°–12.5′. Longitude, West, 84° 9′. Tow at 300 fms. This colony is also attached to an inhabited shell (see Pl. 7, fig. 5). It will be seen that the differences of the number of annulations and the curvature of the gonothecae are far too slight to be of specific value.

Obelia (?) sp.

Plate 5, Figs. 5–7.

Trophosome : — Stems simple, unbranched, rising from a simple creeping stolon, with four to six annulations at the base and the same number immediately above the origin of each peduncle. The hydrothecae occur alternately on opposite sides of the stem, borne on short, stout peduncles of four to six annulations ; their length is about two and a half times their greatest breadth, they taper gradually to the base, the diaphragm is well marked, the rim bears about sixteen pointed teeth arranged in pairs, the space be-

tween each pair being cut a trifle deeper than the space between the two teeth of each pair, and a striation beginning at the centre of each of the deeper indentations of the rim is continued proximally for a third or a half of the length of the hydrotheca.

Gonosome : — Unknown.

Habitat : — Perico Island.

The method of reproduction being unknown, makes it impossible to determine the generic relations of this species, and because there are only a very few specimens, and they so small as to suggest the possibility of their being young colonies, I do not believe in giving it a specific name. There are, so far as I know, three other species which have hydrothecae of a similar shape, with the same arrangement of the teeth in pairs, and the same striations. They are *Campanularia* (?) *spinulosa* Bale[1]; *Obelia bidentata* Clarke[2]; and *O. bicuspidata* Clarke.[2] *C. spinulosa* is like these specimens from Perico Island also in being a small form "about half an inch high" and in having the marginal teeth crested, but much more prominently so than in the Perico specimens. The stem in *C spinulosa* exhibits the rudiments of a compound or polysiphonic structure, there is more annulation of the stem, the peduncles are longer and more slender, the hydrothecae are shorter in proportion to their greatest width, and the teeth are shorter than in the specimens from Perico Island. The number of the teeth in *C. spinulosa* is from 20 to 24; in the Perico form, 16 to 18.

The figure of this Perico form compares very closely with that of *O. bidentata* Clarke, but the latter has a compound stem, attains a height of 150 mm., and is much branched. Our specimens may be young specimens of *O. bidentata*, but without more material and a knowledge of the gonosome that point cannot be determined. Bale makes the same suggestion in regard to his *C.* (?) *spinulosa*. Thornely[3] has described a hydroid *Gonothyrea longicyatha*, from New Britain Island, which also has the teeth in pairs on a castellated rim; the striations, however, are wanting. The stem becomes compound by the development of stolons from the bases of the peduncles, and they grow downward as they do in Bale's *C.* (?) *spinulosa*. Three of these campanulate forms with castellated rims and paired teeth are from the Pacific Ocean, — Perico Island, New Britain Island, and Australia, — and

[1] Proceedings Linnean Soc. New South Wales, June 27, 1888, p. 756.
[2] Transactions Connecticut Acad. Sci., 3, July, 1875, p. 58.
[3] A. Willey's Zoölogical Results, Part 4, Dec., 1899, p. 454.

they are all of small size. The other two are from the Atlantic, Long Island Sound, and are both large species, 75 to 150 mm. in height. It will be interesting to see, when their gonosomes are known, if they are generically related. The gonothecae have been seen in the *G. longicyatha* only, where one of them bore an imperfect external capsule. They are all shallow-water specimens, apparently, although no exact depth is given for *C.* (?) *spinulosa* at Port Jackson.

Campanulina denticulata, sp. nov.

Plate 8.

Trophosome: — The hydrocaulus arises from a simple stolon, is unbranched, nearly colorless, monosiphonic, and has a few annulations, two to four, at its base. Hydrothecae arise alternately on the hydrocaulus, pedunculated, two to five annulations at the base of the peduncle; a diaphragm partly separates the proximal part of the cavity, and this varies much in size, in some instances being one third the length of the hydrotheca, sometimes deeply campulate, sometimes tapering slightly to the distal end, always markedly so to the proximal end, the margin cut into large castellated teeth, ten to twelve in number, an operculum of converging segments equal in number with the teeth, and arising inside the teeth.

Gonosome: — Gonotheca irregularly cylindrical, very long, tapering slightly at the base, full width at the distal end, external opening terminal, not full width and at one side, borne on a peduncle of two annulations arising from the hydrocaulus.

Habitat: — From serial No. 4672, Latitude, South, 13° 11.6′, Longitude, West, 78° 18.3′. Depth 2845 fms. Tanner net tow at 400 fms.

A very delicate form 10 to 15 mm. high.

In general appearance these specimens have the look of a Campanulina with pointed hypothecae (see Pl. **8**, fig. 2), but with a higher power some of them are seen to be campanulate. Some of the hydrothecae have the structure shown in Pl. **8**, figs. *6* and *6b*. This seems to be due to two successive enlargements of the hydrothecae, starting in each instance from within the teeth, in which case the original operculum must have been dropped off or else have had its segments united to form the addition and to leave the succeeding set of teeth at the new rim. The various sets of teeth persisting form an unusual ornamentation, tiara-like in its plan. I have found one

hydrotheca in the specimens in which, even when stained, I can find no trace of teeth, only an operculum, which adds to the difficulty of deciding the generic relations of this peculiar form with both teeth and operculum. As the gonophores are unknown there is far too little basis for creating even a provisional genus for these peculiar hydrothecae.

It is interesting to find a species which combines the general shape of the hydrothecae of the Campanulinidae with the campanulate forms of the Campanularidae; and the operculum combined with teeth is a new combination. Teeth may have sometimes developed into opercula, but this would seem to be a case where the operculum originates at the same place of growth activity as the teeth. In those hydrothecae with the triple rows of teeth the two additions to the length of the hydrothecae may have come about through the growing together of the proximal parts of the segments of the opercula, or, as would seem more probable, by a new cylindrical growth having a toothed rim, after either of which processes there would have been the growth of a new operculum. The latter method would be, with the exception of the formation of the teeth, like the secondary growths seen in *Calycella syringa*, as shown by Nutting[1] and by Levinsen. Figure 17 of Levinsen[2] forms an especially interesting comparison, as in that the segments of the original operculum are retained.

Lafoea gracillima Alder.

One small specimen of this delicate species was brought up by the "Tangles" from Station 4642, five miles southeast from Hood Island, Galapagos Archipelago; depth, 300 fms.; bottom, broken shells and Globigerinae.

This species, so far as I am aware, has been found hitherto only in northern waters: North Atlantic, Bonnevie[3]; Alaska, Clarke[4]; Yellow Sea, Marktanner-Turneretscher[5]; Coast of Maine, Verrill.[6] Its occurence at Station 4642 brings it about two degrees south of the equator.

[1] Bulletin U. S. Fish Comm., 1899, p. 354.

[2] Om Fornyelsen af Ernaeringsindivilderne hos Hydroiderne. Saertryk af Vidensk. Meddel. fra den naturhist. Forening i Kjobenhavn. 1892.

[3] The Norwegian North Atlantic Expedition, Zoölogy, Hydroida, Christiania, 1899, p. 65.

[4] Scientific Results Exploration of Alaska, W. H. Dall, Smithsonian Institution, Washington, 1876, p. 12.

[5] Annalen des K. K. Naturhistorischen Hofmuseums, 5, s. 217.

[6] Amer. Journ. Sci., April, 1874, 7, p. 413.

Thuiaria tubuliformis Marktanner-Turneretscher.

Plate 9.

There are about 20 colonies attached to pieces of a bivalve shell from Perico Island. The specimens are from 25 to 40 mm. in height, and several have gonangia. The internodes are described as "bearing a branch and two hydrothecae on one side and a single hydrotheca on the other." Some of the internodes in these specimens bear a branch and three hydrothecae on one side and two on the other. The tendency of the hydrothecae to arrange themselves in groups, mentioned by Nutting,[1] and especially so toward the distal ends of the branches, is quite pronounced. The localities for this species hitherto reported are all from the Atlantic side of the continent, — Brazil, Florida, and the Bahama Banks. This is yet another instance of the same marine invertebrate occurring on both sides of the Isthmus of Panama.

Sertularella tropica Hartlaub.

Plate 10, Figs. *1–3, 3 b.*

A few small, fragmentary specimens attached to a chitinous worm tube came from Station 4647, Latitude, South; 4° 33′, Longitude, West, 87° 42.5′.

Depth, 2005 fms. Trawl, open net tow to surface from 800 fms.

In Nutting's table of the bathymetrical distribution of the Sertularidae, the greatest depth recorded is 1168 fms., and it is interesting to note that it is a record of this species, and in the Eastern Pacific not far from the Equator. As the worm tube to which this specimen is attached is uninhabited, it may have been floating and have been picked up by the tow net on its way up from the 800 fm. line.

This species was first named *Sertularia variabilis* by myself in 1894, an unfortunate christening, as that specific name was preoccupied. Hartlaub renamed it *tropica* in 1900, and changed it into the genus Sertularella. These two genera are not distinct enough to warrant a further complication of the synonymy by calling this again Sertularia. The determination of genera in the Hydroida is perhaps peculiarly unsatisfactory, inasmuch as there is oftentimes only the perisarc from which the description is written, and in some cases only that of the trophosome. The recognition of genera being largely a matter of convenience, and as the fuller knowledge shows us ever more

[1] Special Bulletin, Smithsonian Institution, 1901, Part 2, p. 70.

and closer relationships, fewer distinct groups, the scientific attitude would seem to look toward the reduction of the number of genera and species, and to limiting the number of new names as much as possible.

Zygophylax chazaliei Versluys

Plates 11–13.

Perisiphonia chazaliei Versluys.[1]

Two specimens were taken on the "Tangles" at a depth of 300 fms., five miles from the southeast end of Hood Island, Galapagos Archipelago, from a bottom of broken shells and Globigerinae, in Latitude 1° 30.5′ South, Longitude 89° 35′ West. They are about 40 mm. in height, of a light yellow horn color, and agree very well with the careful description and figures of Versluys.

Both colonies were broken off short at the bases of the main stems, making it impossible to determine the exact connection of the axial and peripheral tubes with the tubes of the hydrorhiza. The basal portion of the axial tube, when separated from the peripheral tubes, shows a number of peripheral tubes originating from it; all of them are continued upward, some of them branching (Pl. **13**, fig. *1*). As the thickness of the main stem is determined by the number of peripheral tubes, and as the size is greatest at the base, there must be many peripheral tubes arising from the hydrorhiza; and as the main stem decreases in size distally, few, if any, of the peripheral tubes from the base reach the top. As pointed out by Versluys, the peripheral tubes of the main stem send branches to the pinnae (see Pl. **11**, fig. *5*, and Pl. **13**, fig. *2*). The two peripheral tubes between which the hydrothecae project have membranous outgrowths on the portions of their opposed surfaces which lie between the hydrothecae, forming something like a collar around each hydrotheca (Pl. **13**, fig. *6*).

In some cases there is an internal ring of the perisarc formed close below the hydrotheca (Pl. **11**, fig. *4*).

The number of axial tubes at the base of the main stem is about 30, something like 12 of these showing on one half the surface when viewed as an opaque object. This number agrees well with that given by Versluys "près de son sommet," where, in these specimens, the number is much less.

[1] Mémoires Société Zoologique France, **12**, p. 29, 1899.

Versluys's statement is, "Ainsi, sur une coupe transversale d'un tronc principal assez près de son sommet, je compte trente ou trente-et-un tubes périphériques, entourant le tube axial d'une couche triple." The size of the pinnules and the number and arrangement of their peripheral tubules is like that given by Versluys.

In the short uncovered, distal portions of the axial tube the hydrothecae are attached to the stem in their basal part for nearly half their entire length. After a brief soaking in caustic potash they are partly separated (Pl. **11**, fig. *3*), while after boiling in caustic potash they become entirely free (Pl. **11**, fig. *4*; Pl. **12**). Pictet and Bedot have already called attention to this fact. It is also to be noted that after this treatment the hydrothecae of the main stem appear somewhat pedunculated, while those of the pinnae do not (Pl. **12**; Pl. **13**, fig. *1*).

The two localities for this species are off the Galapagos Islands in the Pacific, and off the Testigos Islands some fifty miles north of Venezuela in the Caribbean Sea. This is another of those interesting cases where the same marine form is found on both the Atlantic and Pacific sides of the Isthmus of Panama to which Mr. Alexander Agassiz first called attention in 1888.

Kirkpatrick in 1890 wrote, "It would appear, then, that Perisiphonia is synonymous with Zygophylax." I agree with him, and with Jäderholm, that the slight difference of the continuation of the peripheral tubes quite or not quite to the distal ends of the stem and branches is not a sufficient basis for generic distinction, and therefore the species described as Perisiphonia must be classified as of the genus Zygophylax. This genus now comprises these seven species:—

Zygophylax profunda Quelch, 1885, Cape Verde Islands	500 fathoms
Zygophylax (Perisiphonia) pectinata Allman, 1888, New Zealand	700 "
Zygophylax (Perisiphonia) pectinata Pictet and Bedot 1900, Gulf of Gascogny	300 metres
Zygophylax (Perisiphonia) pectinata Pictet and Bedot, 1900, Azores	318 "
Zygophylax pectinata, Jäderholm, 1903, Eastern Atlantic (about 500 miles west of Gibraltar)	162 fathoms
Zygophylax operculata Jäderholm, 1903, Patagonia, Cape Valentyn	150 "
Zygophylax (Perisiphonia) filicula Allman, 1888, Azores	450 "
Zygophylax (Perisiphonia) filicula Allman, 1888, Australia	150 "
Zygophylax tizardensis Kirkpatrick, 1890, China Sea	35 "
Zygophylax chazalici Versluys, 1899, Testigos Island	80 metres
Zygophylax chazalici Clarke, 1907, Hood Island	300 fathoms
Zygophylax biarmata Billard, 1905, Bay of Biscay	not given

Two of the seven species (*profunda* and *operculata*) have the irregularly branched habit of the species of Lafoea, the form of the colony of *biarmata* is not given, and the other four have the rigid regular habit of *pectinata* and *filicula*.

The gonosome has been found in only one of these species, *pectinata*, by Pictet and Bedot, and there is some doubt as to the character of the structures found, as, in addition to certain gonophore-like bodies, there is a Coppinia cluster on the same stem. This is most beautifully figured by M. Bedot on Plate 5,[1] and he suggests of the gonophore-like bodies, "il est possible qu'ils représentent les gonothèques d'un des sexes et la coppinie les gonothèques de l'autre."

Some of the species are closely similar, and with more material and a knowledge of the gonosomes in all of them there may be some rearrangement needed. They have a wide distribution in the Atlantic and Pacific oceans and are deep-water forms, from 35 to 500 fms.

Cladocarpus distomus, sp. nov.

Plate 14.

Trophosome: — Stem compound at the base, the hydrotheca-bearing tube on the surface simple in about the distal third, 50 mm. in height, but imperfect, the top being broken off, bearing, near the base, one branch which is compound in its basal half, simple in its distal half; also eight widely separated alternate pinnae composed of a single tube, with the stem processes of three other more proximal ones which had been broken off, one pinna on the branch, and processes of four others; pinnae divided by transverse nodes into long internodes, each of which bears one hydrotheca. Hydrothecae long, tapering to the base with an outer margin, which in side view is slightly S-shaped, intrathecal ridge absent, margin with one prominent pointed tooth and the remainder slightly uneven. Nematophores large, the supra-calycine tubular, extending well above the hydrothecae, with a transverse slit-like terminal orifice, and a circular lateral opening on the inner side near the top; the two mesial nematophores are one below the node, and one below the hydrotheca, the free end of the latter not reaching to the base of the hydrotheca; they are stout, broad, with a wide transverse slit-

[1] Pictet and Bedot, Résultats des Campagnes Sci. du Prince de Monaco, Fasc. 13, 1900.

like opening in every respect like those of the pinna-bearing tube on which there are 12 to 14 nematophores between each two adjoining pinnae.

Gonosome : — Not present.

Habitat : — Station 4630. Latitude N., 6° 52′. Longitude W., 81° 42.5′. Depth, 556 fms.

There are 6 tubes showing in surface view of the base of the main stem, hence there must be at least 12 in it, and these apparently all come from the hydrorhiza. The hydrotheca-bearing tube disappears at the base under some of the simple tubes.

This species is nearest to *C. dolicotheca* Allman and *C. flexuosus* Nutting, but differs from them both in the compound character of the main stem, the nodal joints of the pinnae, and in the structure and the arrangement of the nematophores. Neither are there any "imperfect septa (septal ridges)" in the parts of the stem at the backs of the hydrothecae.

Plumularia helleri Hincks.

Plate 15.

Two colonies of this delicate Plumularian attached to a large spicule of a siliceous sponge were collected in the Gulf of Panama; one at Station No. 4621; Lat. N. 6° 36′, Long. W. 81° 44′, depth 581 fms.; and the other at Station No. 4622, Lat. N. 6° 31′, Long. W. 81° 44′, depth 581 fms.

A slight difference in the two specimens is noticed in the position of the hydrothecae on the internodes: in the specimen from Station 4621 the inner part of the rim of the hydrotheca is on a level with the node; in the other specimen the rim is below the node.

Aglaophenia struthionides Murray

Plate 10, figs. *4–6*.

A single stem of this beautiful species, with several corbulae, is from Station 4643. Depth, 100 fms.; bottom, broken shells and Globigerinae. Locality about $4\frac{1}{2}$ miles southwest by south from the west end of Hood Island, Galapagos Archipelago.

In several collections I have had from the Pacific Coast of the United States, this has been the most abundant species. This extends the range of Puget Sound to San Diego, southward to the Galapagos. It was described by Murray in 1860 as *Plumularia struthionides*, and by Clarke in 1876 as *Aglaophenia struthionides*.

EXPLANATION OF PLATES.

When not otherwise specified, drawings are by S. F. Clarke.

PLATE 1.

Plate 1.

Pennaria pacifica, page 6.

Figures 1 and 2 by J. H. Emerton.

Fig. 1. A hydranth from which the filiform tentacles have been cut away, bringing more clearly to view the somewhat irregular arrangement of the capitate tentacles in the adult hydranth.

Fig. 2. A perfect hydranth of the same.

Fig. 3. A hydranth, camera sketch. × 40.

Fig. 4. A colony, natural size.

Fig. 5. Part of a pinna with a peduncle. × 116.

Fig. 6. The distal part of a main stem. × 20.

H. EMERTON.

HELIOTYPE CO. BOS

PLATE 2.

Plate 2.

Pennaria gibbosa, page 7.

Fig. 1. Part of a pinna with peduncles. × 60.

Fig. 2. Hydranths. × 40.

The above are from the type specimens of L. Agassiz, which are not in a good state of preservation.

Fig. 3. Part of a pinna with peduncles. × 60.

Fig. 4. Hydranths with some of the tentacles not drawn, to show the outline of the bodies of the hydranths. × 40.

The last two figures are from specimens from Bahia Honda originally described as *P. symmetrica* Clarke.

Fig. 5. Showing the arrangement of the capitate tentacles on a hydranth of a small specimen in a small phial labelled Tortugas Id. This phial is in the larger bottle containing the type specimen of L. Agazziz. × 60.

HELIOTYPE CO., BOSTON

PLATE 3.

Plate 3.

Pennaria tiarella, page 7.

Fig. 1. Base of a stem of a colony growing on a pile of the wharf, Woods Hole, Mass. × 20.

Fig. 2. Top of the same stem. × 20.

Fig. 3. Top of a stem of a colony growing on a blade of eelgrass (Zostera), Woods Hole, Mass. × 20.

Fig. 4. Base of the same colony. × 20.

HELIOTYPE CO., BOSTON.

PLATE 4.

Plate 4.

Pennaria tiarella, page 7.

The figures are from camera drawings finished by J. H. Emerton.

Fig. 1. A very young hydranth showing the filiform tentacles and the most distal capitate tentacles appearing first, the capitate in a verticil. × 40.

Fig. 2. A somewhat older hydranth with the second verticil of capitate tentacles showing. × 40.

Fig. 3. A later stage with the capitate tentacles still in verticils. × 40.

Fig. 4. A still older hydranth with the filiform tentacles cut away, showing the capitate tentacles now in an irregular arrangement, especially on the proximal part of the hydranth. × 40.

HELIOTYPE CO., BOSTON.

PLATE 5.

Plate 5.

Campanularia ? obliqua, sp. nov., page 9.

Fig. 1. Natural size, growing on *Thuiaria tubuliformis*.

Figs. 2 and 3. The two specimens enlarged. × 116.

Fig. 4. The same specimen as figure 2. × 60.

Obelia (?) sp., page 10.

Fig. 5. Natural size, on *Thuiaria tubuliformis*.

Fig. 6. An entire colony. ×116.

Fig. 7. The distal end of a hydrotheca.

HELIOTYPE CO., BOSTON.

PLATE 6.

Plate 6.

Obelia striata, page 9.

Fig. 1. A part of a colony; a, young gonothecæ; b, a hydrotheca much less than the usual size; c, a hydrotheca of the normal size and shape; d and e, hydrothecae from the same stem showing a transverse constriction. × 80.

Fig. 2. A part of another stem with normal hydrothecae and a perfect gonotheca. × 80.

Fig. 3. Another hydrotheca from the same stem. × 80.

Fig. 4. Two gonothecae on the hydrorhiza. × 80.

Figs. 5, 5b, 5c. Three hydrothecae from one stem. × 80.

Figs. 6, 6b. Two hydrothecae from still another stem. × 80.

Fig. 7. A gonotheca containing the peculiar gonozoöid. × 116.

Fig. 8. A colony, natural size, attached to a shell.

HELIOTYPE CO., BOSTON

PLATE 7.

Plate 7.

Obelia striata, page 9.

The figures are from camera drawings finished by J. H. Emerton.

Fig. 1. Basal part of a colony with gonothecae. × 80.

Fig. 2. Distal end of a colony. × 80.

Fig. 3. A piece of the hydrorhiza, with gonothecae. × 80.

Fig. 4. The distal end of a hydrotheca showing the deeply fluted margin more highly magnified.

Fig. 5. A colony growing on a small shell, natural size.

PLATE 8.

Plate 8.

Campanulina denticulata, page 12.

Fig. 1. A single colony, natural size.

Fig. 2. A colony with gonotheca. × 20.

Fig. 3. A hydrotheca with the hydranth partly expanded. × 116.

Fig. 4. A hydrotheca with the operculum infolded, and only a frayed remnant of the hydranth left. × 116.

Fig. 5. This shows the teeth and operculum in normal position. × 116.

Figs. 6 and 6b show the two hydrothecae that have three rows of teeth and an operculum. × 116.

Fig. 7. The one hydrotheca that has no teeth. × 116.

Fig. 8. The gonotheca. × 116.

HELIOTYPE CO. BOSTON

Plate 9.

Plate 9.

Thuiaria tubuliformis, page 14.

The figures are from camera drawings finished by J. H. Emerton.

Fig. 1. A colony, natural size.

Fig. 2. Part of a colony. × 60.

Fig. 3. A hydrotheca showing successive additions. × 116.

Figs. 4 and 5. Gonothecae. × 60.

Plate 10.

Plate 10.

Sertularella tropica, page 14.

Fig. 1. An entire colony. × 12.

Fig. 2. Part of a colony showing origin of branches. × 12.

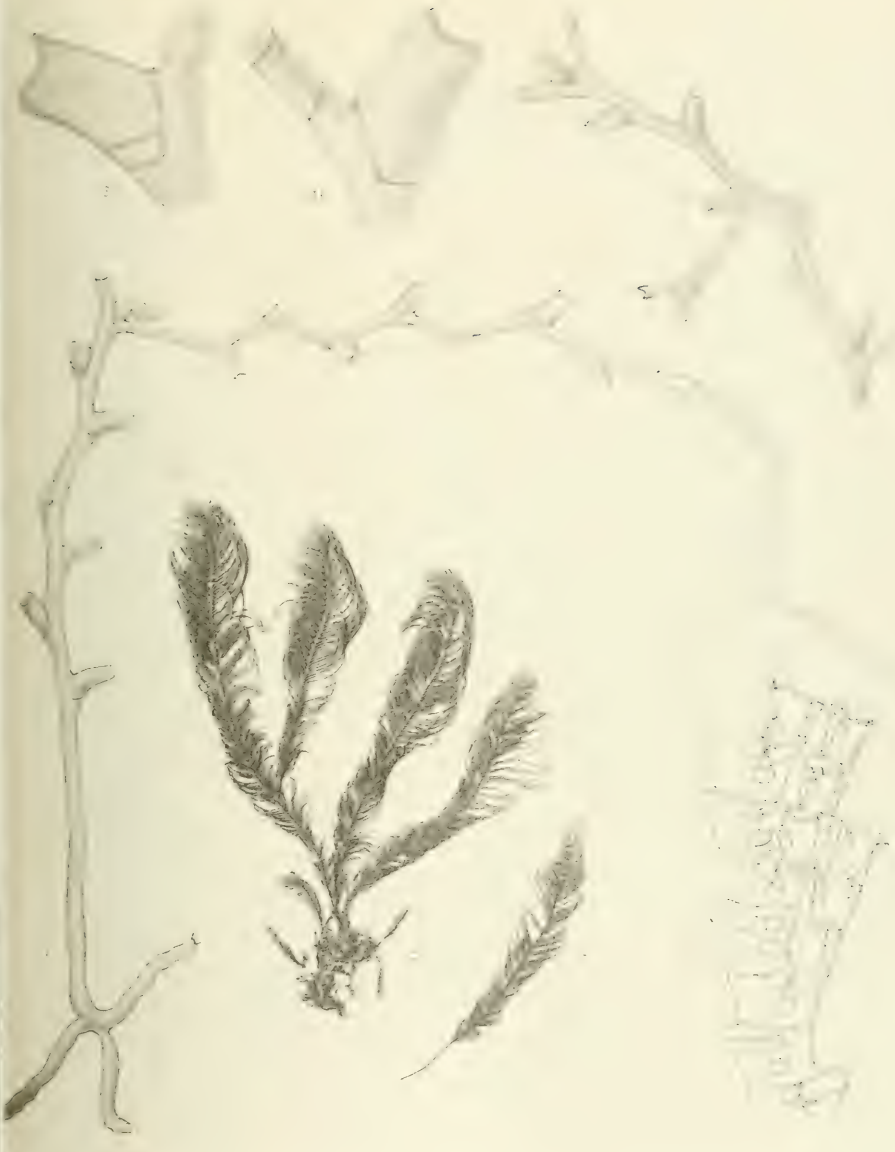
Figs. 3, 3b. Two hydrothecae enlarged. × 80.

Aglaophenia struthionides, page 18.

Fig. 4. A stem from off Hood Island, natural size.

Fig. 5. An entire colony from Southern California, natural size.

Fig. 6. Part of Fig. 4 enlarged.



FIGURES 1, 2, 3 BY J. H. EMERTON.

PLATE 11.

Plate 11.

Zygophylax chazaliei, page 15.

Figures from camera drawings finished by J. H. Emerton.

Fig. 1. A colony, natural size.

Fig. 2. A part of the main stem; a, pinnae. × 60.

Fig. 3. Part of the central tube from the main stem; dissected after maceration in cold KHO. × 60.

Fig. 4. Part of the central tube after maceration in boiling KHO. × 116.

Fig. 5. Showing the mode of branching of the central and of one of the peripheral tubes × 60.

HELIOTYPE CO., BOSTON.

PLATE 12.

Plate 12.

Zygophylax chazaliei, page 15.

Fig. 1. Part of the basal portion of the main stem after maceration in boiling KHO, showing the axial and peripheral tubes. × 60.

HELIOTYPE CO., BOSTON.

PLATE 13.

Plate 13.

Zygophylax chazaliei, page 15.

Fig. 1. Part of the central tube after maceration in boiling KHO. This shows especially well the mode of origin of the peripheral tubules. × 60.

Fig. 2. The branching of a peripheral tube.

Fig. 3. The distal end of one of the pinnae. × 60.

Figs. 4 and 5. Nematothecae. × 300.

Fig. 6. Two adjoining peripheral tubes through which the hydrothecae project. × 60.

HELIOTYPE CO., BOSTON.

PLATE 14.

Plate 14

Cladocarpus distomus, page 17.

Figures from camera drawings finished by J. H. Emerton.

Fig. 1. The colony, natural size.

Fig. 2. Part of a pinna seen from the lower side. × 30.

Fig. 3. Part of a pinna in side view. × 30.

Fig. 4. A portion of the upper, simple part of the main stem. × 30.

Fig. 5. A portion of the main stem where it is compound, composed of two tubes. × 30.

Figs. 6 and 7 show the nodal thickenings in the perisarc.

Figs. 8 and 9 show the rim or margin of the hydrothecae. × 116.

Fig. 10. One of the supra-calycine nematothecae with its two openings. × 300.

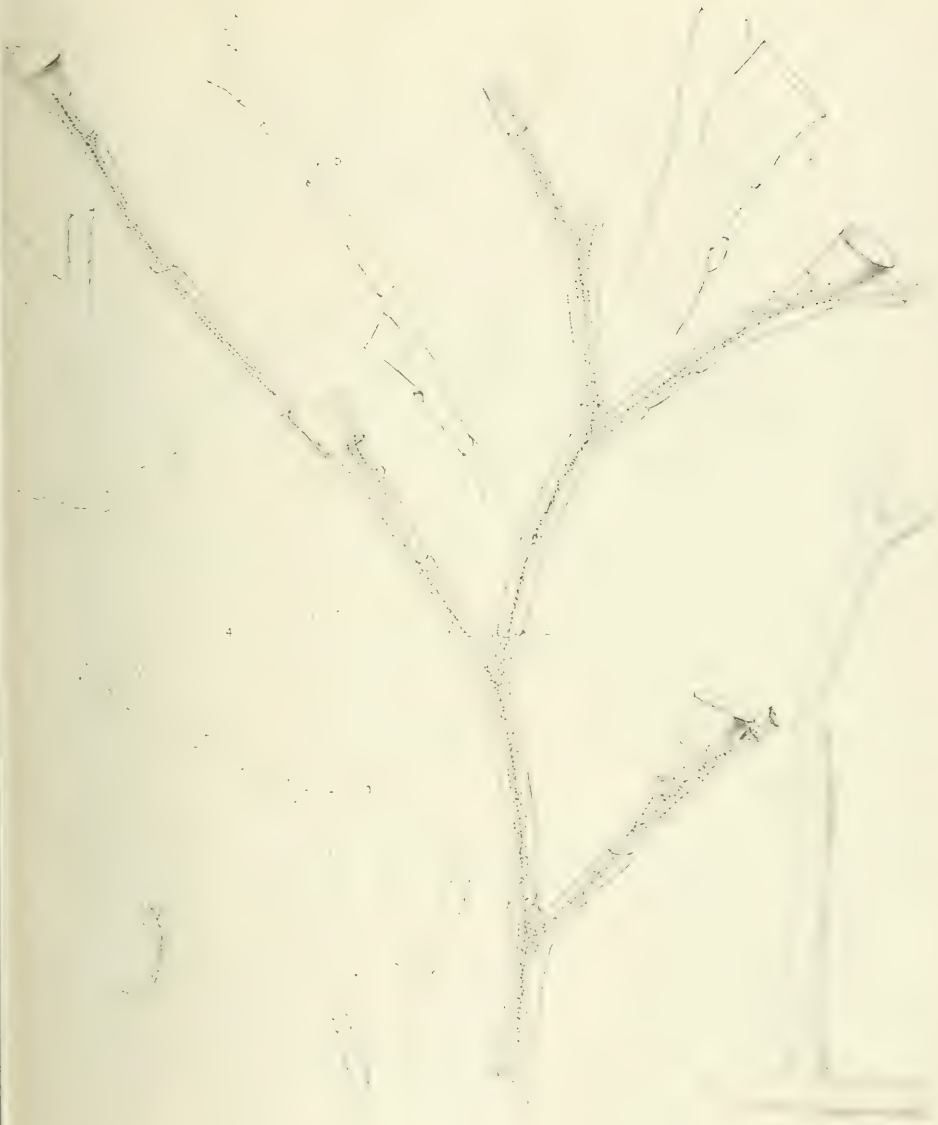
2
3
4
5

PLATE 15.

PLATE 15.

Plumularia helleri, page 18.

Fig. 1. A colony, natural size.
Fig. 2. Part of a colony. × 75.
Fig. 3. The basal portion of a stem. × 60.
Fig. 4. Part of the main stem of a second colony. × 50.
Fig. 5. A pinna from figure 4. × 50.
Fig. 6. An internode enlarged. × 125.



HELIOTYPE CO., BOSTON.

Memoirs of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. XXXV. No. 2.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING.

IX.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT.-COMMANDER L. M. GARRETT, U. S. N., COMMANDING.

X.

THE BRACHYURA.

By MARY J. RATHBUN.

WITH NINE PLATES.

[Published by permission of George M. Bowers, U. S. Commissioner of Fish and Fisheries.]

CAMBRIDGE, U. S. A.:
Printed for the Museum.
August, 1907.

TABLE OF CONTENTS.

	Page
Introduction	25
Ocypode ceratophthalma	26
Ocypode cordimana	26
Uca tetragonon	26
Uca gaimardi	26
Cardisoma carnifex	26
Cardisoma rotundum	27
Grapsus grapsus tenuicrustatus	27
Grapsus strigosus	27
Grapsus longitarsis	28
Geograpsus grayi	28
Geograpsus crinipes	28
Geograpsus lividus stormi	29
Leptograpsus variegatus	29
Metopograpsus messor	29
Pachygrapsus transversus	29
Pachygrapsus plicatus	29
Pachygrapsus fakaravensis, Pl. 5, Fig. 1; Pl. 9, Figs. 6, 6*a*	29
Pachygrapsus minutus	30
Pachygrapsus longipes	30
Ptychognathus easterana, Pl. 2, Fig. 4; Pl. 7, Figs. 4, 4*a*	31
Pseudograpsus albus	32
Hemigrapsus elongatus, Pl. 2, Fig. 2; Pl. 7, Figs. 2, 2*a*	32
Sesarma (Sesarma) rotundatum	33
Sesarma (Sesarma) trapezoideum	33
Sesarma (Parasesarma) plicatum	34
Sesarma (Parasesarma) carolinensis, Pl. 5, Figs. 2, 2*a*; Pl. 9, Fig. 1	34
Sesarma (Holometopus) obtusifrons	35
Sesarma (Holometopus) villosum	35
Helice leachii	36
Cyclograpsus longipes	36
Cyclograpsus parvulus	36
Plagusia speciosa	36
Plagusia dentipes	36
Perenon planissimum	37
Carpilius maculatus	37
Carpilius convexus	37
Carpilodes tristis	37
Carpilodes rugatus	37
Carpilodes monticulosus	37
Atergatis ocyroe	37
Platypodia anaglypta	38
Platypodia digitalis, Pl. 1, Fig. 6; Pl. 9, Figs. 4, 4*a*	38
Zosimus aeneus	38
Lophozozymus dodone	39
Leptodius sanguineus	39
Leptodius gracilis	39
Leptodius efferens, Pl. 1, Fig. 11; Pl. 7, Figs. 6, 6*a*	39
Xanthodius cristatus	41
Cycloxanthops cavatus, Pl. 5, Fig. 8; Pl. 6, Figs. 3, 3*a*	41
Etisus laevimanus	42
Etisodes electra	42
Actaea tomentosa	42
Actaea affinis	42
Actaea hirsutissima	42
Actaea remota, Pl. 1, Fig. 9; Pl. 7, Fig. 1	43
Actaea rufopunctata	43
Actaea cavipes, Pl. 1, Fig. 2	44
Daira perlata	44
Xanthias lamarckii	44
Xanthias ponapensis, Pl. 7, Figs. 5, 5*a*	44
Xanthias notatus	45
Xanthias canaliculatus	45
Chlorodiella niger	46
Chlorodiella laevissima	46
Phymodius ungulatus, Pls. 3, 4	46
Chlorodopsis venusta, Pl. 1, Fig. 5	49
Chlorodopsis spinipes, Pl. 2, Fig. 5	49
Chlorodopsis scabricula, Pl. 1, Fig. 3; Pl. 9, Fig. 5	50

	Page
Cyclodius ornatus, Pl. 5, Fig. 5; Pl. 7, Fig. 8	51
Cyclodius gracilis, Pl. 1, Fig. 10; Pl. 7, Fig. 7	51
Pilodius paumotensis, Pl. 8, Figs. 2, 2*a*, 2*b*	52
Cymo melanodactylus	53
Cymo quadrilobatus, Pl. 1, Fig. 7	53
Ozius rugulosus	53
Ozius guttatus	53
Ozius hawaiiensis	54
Ozius tricariuatus, Pl. 2, Fig. 3	54
Pilumnus andersoni	55
Pilumnus cursor	55
Pilumnus globosus	56
Pilumnus tahitensis	56
Actumnus integerrimus, Pl. 1, Fig. 12; Pl. 8, Figs. 3, 3*a*, 3*b*	56
Eriphia sebana	57
Eriphia scabricula	57
Trapezia rufopunctata	57
Trapezia cymodoce	58
Trapezia cymodoce dentata	58
Trapezia cymodoce ferruginea	58
Trapezia cymodoce areolata	59
Trapezia cymodoce maculata	59
Trapezia digitalis speciosa	59
Trapezia digitalis bella	59
Tetralia glaberrima	60
Domecia hispida	60
Lybia caestifera	60
Caphyra rotundifrons, Pl. 1, Fig. 4	60
Catoptrus nitidus	60
Portunus (Achelous) granulatus	60
Callinectes alexandri, Pl. 2, Fig. 1; Pl. 9, Figs. 3, 3*a*, 3*b*	61
Thalamonyx parvidens, Pl. 5, Fig. 9	62
Thalamita crenata	62
Thalamita coeruleipes	63
Thalamita admete	63
Thalamita gardineri	63
Thalamitoides quadridens	64
Carupa laeviuscula	64
Menaethius monoceros	64
Halimus borradailei	64
Perinea tumida	65
Schizophrys aspera	65
Lophomicippa	65
Lophomicippa limbata, Pl. 5, Fig. 3; Pl. 6, Figs. 1–1*g*	65
Parthenope (Parthenope) melana, Pl. 5, Fig. 6; Pl. 6, Fig 2	66
Calappa hepatica	67
Matuta banksii	68
Nucia gelida, Pl. 5, Fig. 4; Pl. 9, Figs. 2–2*c*	68
Leucosides whitmeei	68
Ocypode gaudichaudii	69
Grapsus grapsus	69
Planes minutus	69
Micropanope taboguillensis, Pl. 1, Fig. 8; Pl. 7, Figs. 3, 3*a*	69
Xanthodius sternberghii	70
Cycloxanthops vittatus	70
Actaea dovii	71
Ozius verreauxii	71
Ozius agassizii	71
Heteractaea lunata	71
Eriphia squamata	71
Portunus (Achelous) affinis	71
Euphylax dovii	72
Acanthonyx petiverii	72
Pelia pacifica	72
Scyramathia cornuta	73
Scyramathia vesicularis, Pl. 5, Fig. 7; Pl. 8, Figs. 1, 1*a*	73
Mithrax bellii	74
Mithrax denticulatus	74
Thoe erosa	74
Calappa convexa	74

THE BRACHYURA

As dredging and shore collecting were of secondary importance during the two cruises of the "Albatross" in the tropical Pacific, the adult Decapods obtained by no means represent the complete fauna of the area visited. Nevertheless, 136 species of Brachyura were obtained, and among them 18 species and one genus new to science.

The majority of the new forms are from the Caroline Islands and the Paumotu Archipelago, while two come from Easter Island. A remarkable discovery is that of a Callinectes inhabiting Tahiti and the Fijis. The genus is one heretofore restricted to middle America and the west coast of Africa. The insular species, even as observed in the young, is a strongly marked one. An addition to the deep-water fauna is a Scyramathia, dredged in 300 fathoms off the Galapagos.

A young specimen of the shore crab, *Grapsus longitarsis*, only 6.5 mm. wide, but having the form of the adult, was taken in the intermediate tow-net, between 300 fathoms and the surface, at station 4717, about 600 miles southwest of the Galapagos Islands, where the depth of the ocean is 2153 fathoms, and where the South Equatorial Current sweeps in a northwesterly direction past the Galapagos towards the Mid-Pacific. It is not surprising, then, that this species when full grown does not inhabit the Galapagos, but is known to occur at the Paumotus, the Ellice, and the Hawaiian Islands. If this single example is representative, the species is fully equipped for its littoral life long before it reaches its final habitation.

The type specimens described below are in the United States National Museum.

The drawings were made by Miss E. G. Mitchell, the photographs by Mr. Clarence Dodge.

INDO-PACIFIC REGION.

OCYPODIDAE.

Ocypode ceratophthalma (Pallas).

Ocypoda ceratophthalma Alcock,[1] 1900, **69**, 345.

Rangiroa Id., Paumotus; shore; Sept 23, 1899; 1 ♂.
Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 juv.
Makemo Id., Paumotus; Oct 21, 1899; 1 ♂.
Nomuka Iki, Tonga Group; shore; Dec. 2, 1899; 2 ♂.
Guam Id., Ladrone Ids.; Feb. 22, 1900; 1 ♀.

Ocypode cordimana Desmarest.

Ocypoda cordimana Alcock, 1900, **69**, 349.

Nomuka Iki, Tonga Group; shore; Dec. 2, 1899; 1 ♂, 1 ♀.

Uca tetragonon (Herbst).

Gelasimus tetragonum Alcock, 1900, **69**, 357.

Borabora Is., Society Group; shore; Nov. 17, 1899; 9♂, 2♀.
Tongatabu, Friendly Islands; reef and shore; Nov. 30, 1899; 5♂, 1♀.
Tarawa Is., Gilbert Group; shore; Jan. 3, 1900; 1♂.

Uca gaimardi (Milne Edwards).

Gelasimus gaimardi Milne Edwards, Ann. Sci. Nat., 1852 (3), **18**, 150, pl. 4, fig. 17.

Near Papeete, Tahiti; Sept. 29, 1899; 3 ♂, 2 ♀.
Borabora Is., Society Group; shore; Nov. 17, 1899; 22 ♂, 10 ♀.
Kusaie, Carolines; Feb. 9, 1900; 1 ♂.

GECARCINIDAE.

Cardisoma carnifex (Herbst).

Cardiosoma carnifex Alcock, 1900, **69**, 445.

Rangiroa Island, Paumotus; beach; Sept. 21, 1899; 1 ♂.
Rangiroa Island on Mohegan Beach; Sept. 21, 1899; 1 ♂.
Near Papeete, Tahiti; Sept. 29, 1899; 1 ♂ juv., 1 ♀ juv.

[1] As the greater part of the species enumerated are described by Alcock in his "Materials for a Carcinological Fauna of India," published in the Journal of the Asiatic Society of Bengal, 1895–1900, **64**-**69**, references to that work are abbreviated to year, number of volume, etc.

Cardisoma rotundum (Quoy and Gaimard).

Thelphusa rotunda Quoy and Gaimard, in Freycinet's Voyage autour du monde, 1825, Zool., **3**, 527, pl. 77, fig. 1 (*Thelphuse chaperon arrondi*).
Cardisoma hirtipes Dana, Proc. Acad. Nat. Sci. Phil., 1851, **5**, 253; Crust. U. S. Expl. Exped., 1852, **1**, 378; atlas, 1855, pl. 24, fig. 2.
Cardiosoma hirtipes, Alcock, 1900, **69**, 447.
Cardisoma rotundum Safford, Contr. U. S. Nat. Herbarium, 1905, **9**, 90. Rathbun, Bull. U. S. Fish. Comm. for 1903 (1906) part 3, 838.

Niue; Sept. 25, 1899; 1 ♀, juv.

Besides the characters given by Alcock (*loc. cit.*) for distinguishing this species from the preceding, the following are very striking: — The width (transverse dimension) of the orbit is about $\frac{3}{4}$ of the anterior width of the front, in *C. rotundum;* the width of the orbit is greater than the anterior width of the front, in *C. carnifex*. The granulated line which marks the antero-lateral border of the carapace is not prolonged behind the level of the gastro-cardiac suture, in *C. rotundum;* while the same line is prolonged far behind the suture, in *C. carnifex*.

In the 3 females of *C. rotundum* which I have examined, the antero-lateral region of the carapace and also the chelipeds are much more roughly granulated than in the males.

GRAPSIDAE.

Grapsus grapsus tenuicrustatus (Herbst).

Grapsus grapsus tenuicrustatus Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 838, and synonymy.

Mohegan Reef, Rangiroa Id., Paumotus; Sept. 21, 1879; 1 ♂, 3 ♀

Rangiroa Id.; beach; Sept. 21, 1899; 1 ♀.

Fakarava, Paumotus; reef, sea beach; Oct. 13, 1899; 1 ♂.

Makemo, Paumotus; Oct. 29, 1899; 1 ♂, 1 ♀.

Grapsus strigosus (Herbst).

Grapsus strigosus Alcock, 1900, **69**, 393.

Tongatabu, Friendly Islands; shore; Nov. 29, 1899; 2, ♂ and ♀ of small size.

Grapsus longitarsis Dana.

Grapsus strigosus longitarsis Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 838, text fig. 4, pl. 8, fig. 1.

Rangiroa Island, Paumotus; beach; Sept. 21, 1899; 1 ♂, 1 ♀.

Mohegan Reef, Rangiroa; Sept. 21, 1899; 1 ♂.

Tikei, Paumotus; shore; Oct. 9, 1899; 1 ♀ with eggs.

Fakarava Island, Paumotus; outer reef; Oct. 12, 1899; 1 ♂.

Funafuti, Ellice Islands; shore; Dec. 25, 1899; 1 ♀.

Between Galapagos and Manga Reva; 300 fath. to surface; station 4717; Jan. 13, 1905; 1 juv.

I now believe the *longitarsis* form to be an independent species. Besides the characters given in the work above cited, *G. longitarsis* has the anterior half of the carapace more tuberculous, front wider, and the ridge running lengthwise across the middle of the palm less distinct than in *G. strigosus*. Although the fingers are narrower at the tip than in typical Grapsus, they are much more hollowed underneath than in Geograpsus.

Geograpsus grayi (Milne Edwards).

Geograpsus grayi Alcock, 1900, **69**, 395.

Niue; Nov. 25, 1899; 1 ♂, 1 ♀.

The width of the meropodites of the ambulatories in this and the following species is not a dependable character. In the U. S. National Museum there are specimens of *G. grayi* from Glorioso Id. in which the meropodites are less than half as wide as long, and a series from Japan in which they are more than half as wide as long.

In *G. crinipes*, which have been handled (from 7 localities), the meropodites are commonly less than half as wide as long, sometimes just half as wide as long.

Geograpsus crinipes Dana.

Geograpsus crinipes Alcock, 1900, **69**, 396.

Makemo Id., Paumotus; Oct. 29, 1899; 1 ♂.

Aruo Atoll, Marshall Ids.; Jan. 27, 1900; 1 ♀.

Ponape, Caroline Ids.; Feb., 1900; 1 ♂, 1 ♀.

Kusaie, Caroline Ids.; Feb. 9, 1900; 1 ♀.

Geograpsus lividus stormi de Man.

Geograpsus lividus var. **stormi** de Man, Zool. Jahrb., Syst., 1895, **9**, p. 88; 1898, **10**, pl. 28, fig. 18 *a* and *c*.

Nukuhiva, Marquesas Ids.; shore, seine; Sept. 15-17, 1899; 1 ♀ with eggs.

Tarawa Id., Gilbert Group; shore; Jan. 3, 1900; 1 ♂.

Tari-Tari Id.; shore; Jan. 6, 1900; 1 ♀.

Leptograpsus variegatus (Fabricius).

Leptograpsus variegatus Kingsley, Proc. Acad. Nat. Sci. Phil., 1880, 196.

Easter Id.; shore; Dec. 21, 1899, Dec. 16, 20, 1904; 4 ♂ 5 ♀; also in La Perouse Bay; Dec. 17, 1904; 7 ♂, 5♀.

Metopograpsus messor (Forskål).

Metopograpsus messor Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 839.

Borabora, Society Ids.; shore and fringing reef; Nov. 17, 1899; 2♂.

Tongatabu; shore and reef; Nov. 29, 30, 1899; 11 ♂, 8♀.

Tari-Tari Id.; shore; Jan. 19, 1900; 1 ♂.

Kusaie, Caroline Ids.; reef; Feb. 8, 1900; 2♀.

Pachygrapsus transversus (Gibbes).

Pachygrapsus transversus Rathbun, Bull. U. S. Fish Comm. for 1900 (1901), **2**, 17.

Easter Id.; shore; Dec. 16, 1904; 1 ♀.

Pachygrapsus plicatus (Milne Edwards).

Pachygrapsus plicatus Kingsley, Proc. Acad. Nat. Sci. Phil., 1880, 200, and synonymy.

Fakarava Id.; Paumotus; outer reef; Oct. 12, 1899; 1 ♂, 1 juv.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂.

Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 (broken).

Kusaie, Caroline Ids.; reef; Feb. 8, 1900; 2 ♀.

Pachygrapsus fakaravensis, sp. nov.

Pl. 5, Fig. *1*; Pl. 9, Figs. *6*, *6a*.

Carapace $\frac{9}{10}$ as long as wide, its whole surface crossed by prominent, granulated lines, the granules diminishing in size from front to back, the

lines fringed anteriorly by hairs lying flat on the carapace, and averaging half the width of the space between ridges. Lateral borders parallel and entire.

Front a little over half width of carapace, steeply inclined, its free edge slightly sinuous and as a whole convex. Middle pair of suprafrontal lobes very prominent and elongate, separated from each other and from the lateral lobes by broad, deep, hairy furrows.

Chelipeds of ♂ unequal, much stouter than legs, $1\frac{1}{2}\times$ as long as carapace, and roughened by striae fringed with hair, those on the arm smooth, those on the wrist granulated, short and curved; those on the outer face of the palm coarsely granulate and longitudinal, except near the top, where they are broken into short lines or tubercles. Inner border of ischium and merus denticulate; inner tooth of wrist stout, sharp-pointed. Fingers narrowly gaping, each with a tooth on the basal half much larger than the other teeth; that on the dactylus is proximal to that on the pollex.

Legs smoothly striated, the striae fringed; those on the merus joints transverse, those on the carpal and propodal joints longitudinal. Last three joints bristly and sparsely long-hairy. Merus with a subterminal spine on the anterior margin, and 3 or 4 spines at the distal end of the posterior margin. Second leg longest, twice as long as carapace.

Dimensions: — ♂, length 18 mm., width 19.5 mm.

Type locality: —Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂ (Cat. No. 32,844, U. S. N. M.).

This species is near *P. plicatus* (Milne Edwards),[1] but is distinguished at once by its parallel sides, coarse striation, and great hairiness.

Pachygrapsus minutus A. Milne Edwards.

Pachygrapsus minutus Rathbun, Bull. U. S. Fish Comm. for 1903 (1906) part 3, 840.

Ponape, Caroline Ids.; reef; Feb. 11, 12, 1900; 6 ♂, 1 ♀.

Pachygrapsus longipes Rathbun.

Pachygrapsus longipes Rathbun, Bull. U. S. Fish Comm. for 1903 (1906) part 3, 840, pl. 8, fig. 7.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀

Kusaie, Caroline Ids.; reef; Feb. 8, 1900; 3 ♂ 1 ♀.

Ponape Caroline Ids.; reef; Feb. 11, 12, 1900; 2 ♀

[1] Hist. Nat. Crust., 1837, 2, 89.

Ptychognathus easterana, sp. nov.

Pl. 2, Fig. *4*; Pl. 7, Figs. *4*, *4 a*.

Male. — Carapace distinctly broader than long, broadest at the posterior of the lateral teeth, slightly convex in an antero-posterior as well as a transverse direction. Surface with a deep median H-form depression, and numerous irregular pits, some of which define the hepatic region. Anterior and lateral portions very finely granulate. Entire upper surface punctate and finely veined.

Fronto-orbital width about $\frac{7}{8}$, and front about $\frac{2}{5}$, the greatest width of the carapace; edge of front sinuous; orbital margin sinuous and directed distinctly backward toward the outer angle.

Two lateral teeth, marked by triangular notches, the posterior the smaller; distance between tips of teeth $\frac{5}{8}$ the distance between the first tooth and the orbital tooth. The branchial ridge arises as far behind the second of the lateral teeth as those teeth are distant from each other; the ridge or granulated line is bent at first strongly inward, then turns strongly backward.

The edge of the front, viewed from before, is curved upward.

The outer maxilliped is much like that of *P. polleni* de Man,[1] but the merus of the endognath has a greater outer extension. The abdomen of the ♂ resembles also that species (*op. cit.*, fig. *20 b*), but the sides of the terminal segment are more divergent at the base.

Chelipeds finely granulate. Wrist with blunt inner angle. Chelae without the patch of hair so conspicuous in some species. Immovable finger with a deep longitudinal groove, which at the base of the finger turns upward on the palm. Fingers with a moderate gape; dactyl with many teeth, the basal one a little larger. Teeth of pollex, 3 large, and 1 or 2 small at basal end. Horny, spoon-shaped extremities of fingers, bordered proximally with a row of short hairs.

Last 3 joints of feet with short setae on the edges; meral joints setose at the extremity, with transverse bands of color.

Dimensions: — ♂, length 10.6 mm., width 12.7 mm.; fronto-orbital width 11 mm., width of front 4.7 mm.

Type locality: — Easter Island; shore; Dec. 20, 1904; 1 ♂ (Cat. No. 32,845, U. S. Nat. Mus.).

[1] Zool. Jahrb., Syst., 1898, **10**, pl. 28, fig. 20 *a*.

The genus Ptychognathus already comprises 12 species and 1 subspecies, all Indo-Pacific. Our species is most closely related to *P. polleni* de Man,[1] from Madagascar, in which the carapace is narrower and front wider, and the branchial ridge arises near the last lateral tooth.

Pseudograpsus albus Stimpson.

Pseudograpsus albus Kingsley, Proc. Acad. Nat. Sci. Phil., 1880, 205.

Fakarava Island, Paumotus; outer reef; Oct. 12, 1899; 1 ♀ juv.

Hemigrapsus elongatus (A. Milne Edwards).

Pl. 2, Fig. *2*; Pl. 7, Figs. *2*, *2 a*.

Heterograpsus elongatus A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, 1873, **9**, 317, pl. 17, fig. 5.

Tongabatu, shore; Nov. 22, 1899; 1 ♂.

The fronto-orbital width is a little less than the length, while the greatest width of the carapace exceeds the length. Carapace almost smooth and punctate, the punctae unequal in size and distribution. Posterior angles of mesogastric region deeply marked. The postero-external surface of the branchial region is very steep, and its upper margin is stronger than the lower, and continued nearly to the posterior margin of the carapace. Front very nearly half as wide as the carapace; the lobes of margin are separated by a broader sinus than shown in Milne Edwards's figure. Upper margin of orbit sinuous, a notch at the inner end. Lateral teeth blunt, formed by small triangular notches, the distance between them less than the distance from the first to the orbital angle.

The left cheliped only is present. Merus and carpus unarmed, the inner angle of the latter bluntly rounded. Palm nearly as high as long, and longer than the fingers, measured horizontally. The longitudinal ridge on the lower half of the palm occupies only the proximal half. Fingers strongly gaping. The large patch of thick hair on the inner side of the chela extends half way on the palm and half way along the pollex, and partly along the occludent edges of the fingers, even to the outer side of the articulation of the dactylus.

The ambulatory legs are chiefly light colored, with a few narrow bands of the dark color of carapace and cheliped. They are sparsely furnished with fine hairs.

[1] *Op. cit.*, 1895, **9**, 94; 1898, **10**, pl. 28, fig. 20.

Abdomen of ♂ rather narrow; terminal segment much longer than wide.

Dimensions: — Length of carapace 8.3 mm.; width 9.1 mm.; fronto-orbital width 7.5 mm.; front 4.4 mm.

Sesarma (Sesarma) rotundatum Hess.

Sesarma rotundata Hess, Arch. f. Naturg., 1865, **31**, 1, 149, pl. 6, fig. 9. Miers, Proc. Zool. Soc. London, 1877, 133, 136. De Man, Zool. Jahrb., Syst., 1887, **2**, 654, 682.
Sesarma dentifrons A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, 1869, **5**, 31. De Man, Zool. Jahrb., Syst., 1887, **2**, 651; Jahrb. Hamburg. Wiss. Anst., 1896, **13**, 110, pl. 3, figs. 6 and 7.
Sesarma gardineri Borradaile, Proc. Zool. Soc. London, 1900, 593, pl. 42, fig. 8.
Sesarma (Sesarma) gardineri Nobili, Ann. Mus. Nat. Hungarici, 1905, **3**, 497.
Sarmatium faxoni Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 841, pl. **7**, fig. 1.

Aruo Atoll, Marshall Group; Jan. 27, 1900; 1 ♂.

Distribution: — Oahu and Marshall Islands (Rathbun); Duke of York Island (Miers); Upolu (A. M. Edwards); Funafuti and Rotuma (Borradaile); Nairai, Fijis (Miers); Seleo, Berlinhafen, New Guinea (Nobili); Sydney (Hess).

I think that Nobili is correct in his surmise that *S. gardineri* Borradaile is the same as *S. rotundatum* Hess. This is also the species that I mistakenly placed in Sarmatium, *S. faxoni* (*loc. cit.*). In the two specimens before me, ♂ and ♀, the anterior $\frac{2}{3}$ of the branchial region is inflated. The ♂ (Aruo) has a soft shell, the lower edge of its front is visible in a dorsal view; in the ♀ (Oahu) this edge is invisible in a dorsal view. In the ♂ the posterior margin of the orbit slopes distinctly outward and backward; in the ♀ almost imperceptibly so.

Neither of these specimens agrees in detail with the type of *S. dentifrons* A.M.Edw. or of *S. rotundatum* Hess as figured by de Man (*loc. cit.*), or with the figure of *S. gardineri* Borradaile, but the differences may be attributed to individual variation.

Sesarma (Sesarma) trapezoideum (Milne Edwards).

Sesarma trapezoidea Milne Edwards, Hist. Nat. Crust., 1837, **2**, 74. De Man, Zool. Jahrb., Syst., 1887, **2**, 654; 1889, **4**, 426, pl. 9, fig. 7.

Fatana River, Tahiti; Nov. 7, 1899; 1 ♂.

Sesarma (Parasesarma) plicatum (Latreille).

Cancer quadratus Fabricius, Suppl. Entom. Syst., 1798, 341. (Not **Cancer quadrata** Meuschen, Mus. Gronov., 1778, 84, which is an indeterminable species of Sesarma (?) from America, nor **Cancer quadratus** Fabricius, Mant. Ins., 1787, **1**, 315, which is an Ocypode.)

Ocypode plicata Latreille, Hist. Nat. Crust., 1803, **6**, 47.

Sesarma quadratum Alcock, 1900, **69**, 413.

Kusaie, Carolines; Feb. 9, 1900; 4 ♂, 4 ♀, 5 juv.

Small specimens, the largest, an adult ♀, measuring only 14.5 mm. in width. Legs marked with irregular transverse stripes of color.

Sesarma (Parasesarma) carolinensis, sp. nov.

Pl. 5, Figs. *2*, *2a*; Pl. 9, Fig. *1*.

Carapace considerably broader than long, and broader anteriorly than posteriorly. Surface almost smooth to the naked eye, but under the lens crossed, except in the middle portion, by fine transverse rugae, which are for the most part short, but the branchial region has 5 or 6 long lines, and the posterior part has some longish lines; surface sparingly punctate. Regions faintly indicated, except the anterior portion of the mesogastric. No lateral teeth.

Front $\frac{3}{5}$ of the fronto-orbital width, vertical; 4 superior lobes subequal and well separated; sides of front parallel; lower margin in front view for the most part straight, but toward the ends rounding up to the lateral margins; in dorsal view, slightly bilobed. Superior margin of orbit sloping almost directly backward to the orbital tooth.

Merus joint of chelipeds with a large laminate anterior expansion, the edge of which is denticulate; the denticles are larger, more irregular, and more projecting on the distal border of the lamina. Upper surface of arm and wrist rugose. Inner angle of wrist blunt. Outer surface of hand for the most part smooth and covered with large punctae; upper part finely granulate, the granules proximally forming rugae; 2 oblique pectinated ridges not parallel to the border of the hand. The upper surface of the dactyls is marked by 14 or 15 transverse ridges, each of which is longer than the intervals between them, and is divided lengthwise by a groove. Each intervening space is occupied by an elevation, sub-triangular in shape, the base of each triangle being at the proximal end of the space. The fingers of the ♂ have a very slight gape; the teeth of the dactylus are smaller than

those of the pollex; the largest tooth of the former lies near its base, of the latter near its middle. Inner surface of palm very finely granulated; a row of granules near and parallel to the distal end of the palm.

Ambulatory legs of moderate length and width. Posterior margin of merus joints unarmed; anterior margin with a sharp sub-distal spine. Last 3 joints furnished with a few stiff bristles and long hairs; dactyli slender, nearly as long as propodi. The legs have irregular transverse bands of color.

Dimensions:— Length 7 mm.; fronto-orbital width 9.7 mm.; posterior width 8.5 mm.; width of front 5.5 mm.

Type locality: — Kusaie, Carolines; Feb. 9, 1900: 1 ♂ (Cat. No. 32,861, U. S. N. M.).

This species most closely resembles *Sesarma* (*Parasesarma*) *lenzii* de Man[1]; but our species has the lamina of the arm-joint less projecting distally, the palm smoother inside and out, the pectinated ridges not parallel to the proximal margin of the palm, and the projections of the upper margin of the movable finger of different shape and not obliquely placed.

Sesarma (Holometopus) obtusifrons Dana.

Sesarma (Sesarma) obtusifrons de Man, Zool. Jahrb., Syst., 1895, **9**, 161; 1898, **10**, pl. 29, fig. 31.

Niue; Nov. 25, 1899; 1 ♂.

This species is variable in its proportions. In the ♂ from Niue the length is to the width as 1:1.35; in a ♂ from Hilo as 1:1.25; while de Man (*loc. cit.*) gives measurements of males, which have a width of 1.31 and 1.34 x their length, respectively.

Abdomen of ♂ from Niue a little narrower than those from Hilo or than that figured by de Man (*op. cit.*, fig. 31*b*).

Sesarma (Holometopus) villosum A. Milne Edwards.

Sesarma villosum A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, 1869, **5**, 31.
Sesarma villosa de Man, Zool. Jahrb., Syst., 1887, **2**, 644.
Sesarma (Sesarma) villosa de Man, Zool. Jahrb., Syst., 1895, **9**, 153; 1898, **10**, pl. 29, fig. 30.

Kusaie, Carolines; Feb. 9, 1900; 1 ♂.

[1] Zool. Jahrb., Syst., 1895, **9**, 193; 1898, **10**, pl. 30, fig. 35.

Helice leachii Hess.

Helice leachii Hess, Arch. f. Natur., 1865, **31**, 1, p. 153.
Helice pilimana A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, 1873, **9**, 313, pl. 18, fig. 1.
Helice leachi de Man, Zool. Jahrb., Syst., 1887, **2**, 690, 702.

Kusaie, Carolines; Feb. 9, 1900; 1 ♂.

Oho Sima, Tokaito coast, Japan; F. Sakamoto coll.; 2 ♂, 1 ♀ (U. S. Nat. Mus.).

In the four specimens before me, the longitudinal ridge on the lower third of the outer face of the palm is very short, present on the proximal end of the palm only; the patch of hair at the base of the fingers is also much restricted, not extending back on the palm as in fig. 1 *a* of Edwards (*loc. cit.*), but confined to the base of the thumb.

Length of largest ♂ (Japan) 22 mm.; greatest width 25.2 mm.

Cyclograpsus longipes Stimpson.

Cyclograpsus longipes de Man, Zool. Jahrb., Syst., 1896, **9**, 355; 1898, **10**, pl. 32, fig. 43.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♀ juv.
Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♀.
Wailangilolu, Fiji Ids.; Nov. 20, 1897; 1 ♂.

Cyclograpsus parvulus de Man.

Cyclograpsus parvulus de Man, Zool. Jahrb., Syst., 1896, **9**, 350; 1898, **10**, pl. 32, fig. 42.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀.

Plagusia speciosa Dana.

Plagusia speciosa Miers, Ann. Mag. Nat. Hist., 1878 (5), **1**, 151.

Makemo Id., Paumotus; Oct. 21, 1899; 1 ♂.
The type is from Waterland Id., Paumotus.

Plagusia dentipes (de Haan).

Plagusia dentipes Miers, Ann. Mag. Nat. Hist., 1878 (5), **1**, 152.

Easter Id.; shore; Dec. 21, 1904; 2 ♂, 1 ♀.

Percnon planissimum (Herbst).

Liolophus planissimus Alcock, 1900, **69**, 439.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀ juv.

PILUMNIDAE.

Carpilius maculatus (Linnaeus).

Carpilius maculatus Alcock, 1898, **67**, 79.

Papeete, Tahiti; Oct. 2, 1899; 1 ♀.
Fakarava Id., Paumotus; outer reef; Oct. 11, 1899; 1 ♀.

Carpilius convexus (Forskål).

Carpilius convexus Alcock, 1898, **67**, 80.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 juv.

Carpilodes tristis Dana.

Carpilodes tristis Alcock, 1898, **67**, 82.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂.

Carpilodes rugatus (Latreille).

Carpilodes rugatus Alcock, 1898, **67**, 84.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂, 1 ♀.
Makemo, Paumotus; reef; Oct. 21, 1899; 1♂, 1 ♀.
Papeete, Tahiti; shore; Nov. 9, 1899; 2 ♂.
Funafuti, Ellice Id.; reef; Dec. 24, 1899; 3 ♂.

Carpilodes monticulosus A. Milne Edwards.

Carpilodes monticulosus Alcock, 1898, **67**, 86.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 2 ♂, 2♀.
Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♀.

Atergatis ocyroe (Herbst).

Atergatis floridus Alcock, 1898, **67**, 98, and synonymy.

Borabora, Society Ids.; shore and fringing reef; Nov. 17, 1899; 1 ♀.

Platypodia anaglypta (Heller).

Lophactaea anaglypta Alcock, 1898, **67**, 102.

Fakarava, Paumotus; shoal in lagoon; Oct. 11, 1899; 1 ♀.
Fakarava, Paumotus; outer reef; Oct. 12, 1899; 1 ♀.

Platypodia digitalis, sp. nov.

Pl. 1, Fig. *6*; Pl. 9, Figs. *4*, *4a*.

Carapace narrower than in most Indo-Pacific species of this genus. Interregional furrows filled with a short tomentum; a few long hairs scattered on the carapace. Granules of surface small, scabrous, and sparsely distributed. Surface behind middle of cardiac region smooth. A median furrow forms two lobules on the broad part of the mesogastric area; protogastric area without longitudinal division. A thin, light-colored rim borders the front, orbits, and antero-lateral margins, and is marked by a closed fissure on the median line, two on the orbit and three on the sides.

Chelipeds heavy, unequal. Outer surface of palms covered with sharp tubercles arranged somewhat in rows; upper edge not cristate, but armed with 5 or 6 tubercles. Fingers very short and stout; pollex shorter than its width at base; tips very stumpy in the large claw, slenderer and more acute in the small claw; prehensile edges of both fingers with a broad tooth; inner and outer surfaces with one or two tufts of hair. On account of the short thumb, the movable finger is more vertical than commonly in the genus.

Ambulatory legs of moderate width, upper edges acute, but not cristate.

Dimensions: — Adult ♀, length 8.4 mm., width 11.5 mm.

Distribution:—

Papeete, Tahiti; reef; Nov. 28, 1899; 1 ♀.

Kusaie, Carolines; 1900; 1 ♀ type (Cat. No. 32,846, U. S. N. M.).

This species belongs to the *granulosa* group of Alcock (1898, **67**, 100), in which the upper border of the hand is not cristate, but *P. digitalis* is separated from others of the group by having the pollex broader than long, the protogastric lobes not longitudinally divided, the ambulatory legs not cristate.

Zosimus aeneus (Linnaeus).

Zozymus aeneus Alcock, 1898, **67**, 104.

Makemo Id., Paumotus; Oct. 20, 1899; 1 ♀.

Lophozozymus dodone (Herbst).

Lophozozymus dodone Alcock, 1898, **67**, 108.

Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 ♀ juv.

This small ♀ (5.2 x 8.7 mm.) is not typical, the hands are narrower than all other, but larger, specimens examined, the immovable finger is more elongate, and the palm is not cristate beneath. In other respects the crab might easily be a *dodone;* the outline and proportion of the carapace are normal, the central portion is very smooth, there are short ridges on the side-teeth T and S (of Dana) and on the hepatic region and just inside of T.

Leptodius sanguineus (Milne Edwards).

Xantho (Leptodius) sanguineus Alcock, 1898, **67**, 119.

Nukuhiva, Marquesas Ids.; shore, seine; Sept. 15–17, 1899; 6 ♂, 3 ♀ (2 ovig.).

Mohican Reef, Rangiroa Id.; Sept. 23, 1899; 3 ♀ (1 ovig.).

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂.

Makatea Id.; shore; Oct. 6, 1899; 1 ♂.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 2 ♂, 1 ♀, ovig.

Makemo, Paumotus; reef; Oct. 21, 1899; 3 ♂.

Borabora, Society Ids.; shore and fringing reef; Nov. 17, 1899; 1 ♂.

Tongatabu; shore; Nov. 29, 1899; 1 ♂.

Tarawa Id., Gilbert Group; shore; Jan. 3, 1900; 1 ♂.

Manga Reva; Feb. 3, 1900; 1 ♂.

Ponape, Caroline Ids.; reef; Feb. 12, 1900; 1 ♂.

Aino Atoll; 1900; 1 ♂.

Leptodius gracilis (Dana).

Chlorodius gracilis Dana, Crust. U. S. Expl. Exped., 1852, **1**, 210; atlas, 1855, pl. 11, fig. 13.

Kusaie, Caroline Ids.; reef; Feb. 8, 1900; 4 ♂, 2 ♀ (1 ovig.).

Leptodius efferens, sp. nov.

Pl. 1, Fig. *11*; Pl. 7, Figs. *6*, *6 a*.

A small species. Carapace broadly oval, the front not projecting beyond the curve of the antero-lateral borders. Regions marked by fine grooves.

Surface finely granulous, with a few ill-marked ridges, the posterior-middle portion nearly smooth. Fronto-orbital width $\frac{3}{5}$ of entire width; front $\frac{1}{2}$ of the former, convex, with a median V-shaped notch and a small outer tooth. Front separated from orbit by a notch and a furrow. Orbits large, nearly filled by the eyes, and having a small notch above and another just below the outer angle. Antero-lateral teeth 5, the second rounded and partly fused with the small first or orbital tooth; third and fourth of good size, fifth small. Short grooves run inward from the lateral sinuses. Carapace equally wide at the fourth and fifth teeth. Margin of front, orbits, and teeth granulous.

The basal segment of the antennæ just meets the downward prolongation of the front. The ridge on the palate is well marked anteriorly, and the notch in the epistome, just outside the ridge, is broad and deep.

Chelipeds unequal in both sexes, short, stout, granulate. The wrist has a distal groove and a stumpy inner tooth. Fingers black, except at the tips, where they are brown, with a white rim on the edge of the shallow spoon. The color of the pollex runs back a little on the palm, more so in the ♂ than in the ♀; the fingers have shallow grooves and are finely granulate at the base; in the ♂ the fingers gape and the prehensile teeth are small; in the ♀, the fingers do not gape, and in the large claw they bear rather large teeth which dovetail together. The tips of the fingers are not enlarged and are hollowed out, but not hooflike.

Ambulatory legs missing.

Last 2 segments of ♂ abdomen short and broad; abdomen narrowest at distal end of the third or compound segment.

Dimensions: — ♂ type, length 3.7 mm., width 5.8 mm., fronto-orbital width 4.3 mm., width of front 2 mm.

Type locality: — Ponape, Carolines; reef; Feb. 11, 1900; 1 ♂ type, 1 ♀ (Cat. No. 32,847, U. S. N. M.).

Differs from typical Leptodius in its more regularly oval form, in the conspicuous granulation of chelipeds and carapace, and in the greater development of the palatal ridge.

Xanthodius cristatus (Borradaile).

Leptodius (Xanthodius) cristatus Borradaile, Fauna Maldive Arch., 1902, **1**, part 3, 252, text fig. 51.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 2 ♀.

Ponape, Carolines; reef; Feb. 11, 1900; 2 ♀ ovigerous.

1 ♂, 3 ♀ are of the size described by Borradaile, and agree with his description but not entirely with his figure. The carapace is widest at the penultimate tooth, the trough on the propodal segments of the legs extends the whole length of the segment, but the propodi are shorter and dactyli longer than shown in the figure. A larger ♀, 5.3 × 8 mm., soft shell, from Makemo, has more marked characteristics. The surface is more uneven, the areolae being more raised, the depressions on the upper surface of the palms are very deep, as on the legs.

Cycloxanthops cavatus, sp. nov.

Plate 5, Fig. *8*; Pl. 6, Figs. *3*, *3a*.

Carapace about $\frac{3}{4}$ as long as broad; posterior half level, anterior half strongly deflexed; surface very uneven. On the anterior half are six longitudinal elevations; two small elevations on inner branchial region; a transverse ridge runs inward from the third and fourth teeth of the sharp lateral border. Between the first and second teeth (orbital angle not included), and just above the margin, there is a deep circular pit; less striking depressions separate the other teeth. Surface closely granulate.

Front deflexed, margin slightly convex, median notch small, orbital angle separated by a rectangular notch.

Basal joint of antenna touching the front with its inner angle; movable portion crowded between the front and the orbital angle. Anterior margin of merus of maxilliped concave; outer angle a produced rounded lobe.

Only the right cheliped is present; its surface is closely granulate and very uneven, like that of the carapace. Upper surface of wrist and hand covered with depressions separated by irregular ridges, which form three nodulous crests on the hand; outer surface with two additional granulate ridges. Fingers short, light-colored, grooved, not gaping, prehensile teeth low, upper edge of dactylus thin, sharp.

Merus of legs with a thin upper crest; carpus and propodus bicristate.

Dimensions: — ♂ type, length 4.7 mm., width 6.6 mm.

Type locality: — Fakarava Island, Paumotus; outer reef; Oct. 12, 1899; 1 ♂ (Cat. No. 32,848, U. S. N. M.).

This species has much the shape of *C. punctatus* (Haswell),[1] but the surface is more uneven, and the front is distinctly separated from the inner angle of the orbit, which is not the case in *punctatus*.

Etisus laevimanus Randall.

Etisus laevimanus Alcock, 1898, **67**, 131.

Borabora, Society Islands; shore and fringing reef; Nov. 17, 1899; 1 ♂.

Lifu; shore; Dec. 13, 1899; 1 ♂.

Etisodes electra (Herbst).

Etisodes electra Alcock, 1898, **67**, 133.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂.

Tara-Tari Id.; shore, reef; Jan. 6, 1900; 4 ♂, 3 ♀.

Actaea tomentosa (Milne Edwards).

Actaea tomentosa Alcock, 1898, **67**, 140.

Ena, Tonga Group; reef; Nov. 20, 1899; 2 ♂, 1 ♀.

Ponape, Caroline Ids.; reef; Feb. 11, 12, 1900; 5 ♂, 7 ♀ (3 ovig.).

Actaea affinis (Dana).

Actaeodes affinis Dana, Crust. U. S. Expl. Exped., 1852, **1**, 197; atlas, 1855, pl. 11, fig. 3.

Makemo, Paumotus; reef; Oct. 21, 1899; 2 ♂.

Actaea hirsutissima (Rüppell).

Actaea hirsutissima Alcock, 1898, **67**, 141.

Papeete, Tahiti; shore; Nov. 9, 1899; 1 ♀.

Borabora, Society Islands; shore and fringing reef; Nov. 17, 1899; 3 ♂, 2 ♀, 1 juv.

[1] Proc. Linn. Soc. N. S. Wales, 1881, **6**, 752.

Actaea remota, sp. nov.

Pl. 1, Fig. *9*; Pl. 7, Fig. *1*.

Carapace broad, about $\frac{2}{3}$ as long as broad, lobulated all over, lobules low and flat, the grooves between them smooth and covered with short hair, the lobules themselves covered with small pearly granules, the narrow interspaces filled with hair no higher than the granules and similar to that between the lobules. Mesogastric region undivided; protogastric regions divided lengthwise into two lobules. Cardiac region undivided. Branchial regions each with about nine lobules. Orbital region marked off by a furrow. Intestinal region more finely granulate.

Front strongly deflexed, moderately arched, median emargination not discernible, owing to a break in the carapace. Orbit with one fissure below, two above. Lateral lobes four, shallow, the first united with the orbital angle, the grooves continued on the under surface, which is finely granulate and almost naked.

The left cheliped is missing. In the right one, the outer surface of the wrist and the proximal end of the upper surface of the hand are indistinctly lobulate. The granulation of wrist and hand is less dense, the hairs more numerous. Dactylus granulous and hairy at base. Both fingers white, hollowed at tip. Legs granulate and pilose, but not lobulate; carpal joints with a longitudinal groove.

Dimensions: — Type, length 6 mm., width 8.7 mm.

Type locality: — Easter Island; shore; Dec. 20, 1904; 1 ♂ (Cat. No. 32,849, U. S. N. M.).

This species appears to be nearest *A. lata* Borradaile,[1] which, however, has long hairs mixed with the short ones, and the fingers pointed and black in color.

Actaea rufopunctata (Milne Edwards).

Actaea rufopunctata Alcock, 1898, **67**, 142.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♀.
Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂.
Funafuti, Ellice Id.; shore; Dec. 25, 1899; 1 ♂.

[1] Fauna & Geog. Maldive & Laccadive Arch., 1902, **1**, pt. 3, 255, text fig. 53.

Actaea cavipes (Dana).

Pl. 1, Fig. *2*.

Actaea cavipes Alcock, 1898, **67**, 147.

Rangiroa Id.; beach; Sept. 21, 1899; 1 ♂.
Fakarava, Paumotus; shoal in lagoon; Oct. 11, 1899; 3 ♂.
Fakarava; outer reef; Oct. 12, 1899; 2 ♂, 1 ♀.
Borabora Ids., Society Group; fringing reef; Nov. 17, 1899; 5 ♂, 2 juv.
Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 ♂, 1 ♀.
Tari-Tari Id.; shore, reef; Jan. 6, 1900; 2 ♂, 3 ♀.

Daira perlata (Herbst).

Daira perlata Alcock, 1900, **67**, 155.

Papeete, Tahiti; reef; Sept. 28, 1899; 3 juv.

Xanthias lamarckii (Milne Edwards).

Xanthodes lamarckii Alcock, 1898, **67**, 157.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂, 1 ♀.
Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂, 4 ♀ (1 ovig.), 1 juv.
Makemo, Paumotus; reef; Oct. 21, 1899; 2 ♂, 2 ♀.
Borabora Id., Society Group; fringing reef; Nov. 17, 1899; 2 ♂, 2 ♀.

Xanthias ponapensis, sp. nov.

Pl. 7, Figs. *5*, *5 a*.

The carapace is almost smooth, punctate, microscopically granulous, granules more discernible along the antero-lateral margin. Orbital region marked off by a groove, gastric region and its subdivisions well delimited, otherwise the carapace is scarcely divided. Frontal lobes faintly sinuous, their outer angles rectangular, and separated from the orbit by a rectangular notch. Antero-lateral margin thick; teeth four (besides the orbital angle), the first minute and distant from the orbit, the third most prominent.

Chelipeds unequal, surface similar to that of the carapace; merus roughly granulous above, wrist and hand smooth to the eye, the larger punctae of the hand arranged somewhat in longitudinal lines. Fingers stout, gaping at

base in larger chela, color almost black, with tips lighter, color prolonged very little on the palm and terminating in an oblique line. Legs hairy; merus joints spinulous above.

Dimensions: — ♂ type, length 6.5 mm., width 9.7 mm., fronto-orbital width 5.7 mm.

Distribution: — Papeete, Tahiti; shore; Nov. 9, 1899; 4 immature.

Ponape, Carolines; reef; Feb. 11, 1900; 2 ♂ (1 ♂ is type, Cat. No. 32,850, U. S. N. M.).

The young specimens from Papeete show much rougher carapace and chelipeds than the adult, the roughness diminishing regularly with age. They measure respectively 6.4, 5.5, 5.2, and 5 mm. in width. The first-mentioned has the larger palm smooth outside, a little granulous above, smaller cheliped missing; No. 2 has the larger palm also smooth outside, but more granulous above, the smaller palm distinctly granulous outside and above; No. 3 has the larger palm a little rough outside as well as above, the smaller palm very granulous; in No. 4 both palms are very rough, the smaller the rougher. One would not believe the smallest specimen to be the same species as the type, were there not intermediate stages.

This species is near *X. flavescens* Rathbun,[1] from the Hawaiian Ids., but the latter is wider and more areolated, the dark color of the pollex runs far back and up on the palm, and the legs are nearly naked.

Xanthias notatus (Dana).

Xanthodes notatus Alcock, 1898, **67**, 158.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 19 ♂, 24 ♀ (2 ovig.).
Makemo, Paumotus; reef; Oct. 21, 1899; 16 ♂, 13 ♀ (4 ovig.).

Xanthias canaliculatus Rathbun.

Xanthias canaliculatus Rathbun, Bull. U. S. Fish Comm. for 1903 (1906) part 3, 856, text fig. 17, pl. 9, fig. 12.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 1 ♀.

[1] Bull. U. S. Fish Comm. for 1903 (1906), part 3, 855, text fig. 15, pl. 9, fig. 11.

Chlorodiella niger (Forskål).

Chlorodius niger Alcock, 1898, **67**, 160.

Rangiroa Id.; Mohican Reef; Sept. 23, 1899; 1 ♂, 1 ♀.
Fakarava, Paumotus; shoal in lagoon; Oct. 11, 1899; 1 ♂, 1♀ (ovig.)
Fakarava, Paumotus; outer reef; Oct. 12, 1899; 6 ♂, 8 ♀ (4 ovig.).
Makemo, Paumotus; reef; Oct. 21, 1899; 8 ♂, 6 ♀.
Borabora Id., Society Group; fringing reef; Nov. 17, 1899; 2 ♂, 2 ♀.
Funafuti, Ellice Id.; reef; Dec. 24, 1899; 2 ♂, 2 ♀, 1 juv.
Tari-Tari Id.; shore, reef; Jan. 6, 1900; 4 ♂, 2 ♀.
Kusaie, Carolines; 1900; 1 ♂, 2 ♀.

Chlorodiella laevissima (Dana).

Chlorodius laevissimus Alcock, 1898, **67**, 161.

Rangiroa Id.; Mohican Reef; Sept. 23, 1899; 3 ♂, 1♀.
Papeete, Tahiti; reef; Sept. 28, 1899; 3♀ (1 ovig.).
Papeete, Tahiti; shore; Nov. 9, 1899; 2 ♂.
Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂, 3 ♀ (1 ovig.).
Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 1 ♀ (ovig.).
Funafuti, Ellice Is.; reef; Dec. 24, 1899: 16 ♂, 13 ♀, 3 juv.
Tari-Tari Id.; shore; reef; Jan. 6, 1900; 1 ♂, 1 ♀.

Phymodius ungulatus (Milne Edwards).

Pls. 3, 4.

Phymodius ungulatus Alcock, 1898, **67**, 162.
Phymodius monticulosus Alcock, *op. cit.*, 163.
Phymodius obscurus Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), 196, part. 3, 858.

Rangiroa Id.; Mohican Reef; Sept. 23, 1899; 2 ♂ ♀.
Papeete, Tahiti; reef; Sept. 28, 1899; 1 juv.
Fakarava, Paumotus; shoal in lagoon; Oct. 11, 1899; 2 ♂, 2 ♀.
Fakarava, Paumotus; outer reef; Oct. 12, 1899; 10 ♂, 14 ♀ (4 ovig.), 7 juv.
Makemo, Paumotus; reef; Oct. 21, 1899; 3 ♂, 1 ♀.
Borabora, Society Ids.; shore and fringing reef; Nov. 17, 1899; 1 ♂, 2 ♀.
Tongatabu; reef and shore; Nov. 30, 1899; 1 ♂.
Funafuti, Ellice Id.; reef; Dec. 24, 1899; 1 ♂, 1 ♀ juv.

Tari-Tari Id.; shore and reef; Jan. 6, 1900; 1 ♂, 2 ♀.

Kusaie, Carolines; 1900; 1 ♂, 3 ♀ (ovig.).

I find it necessary on examination of considerable material to unite the *ungulatus* form with the *monticulosus* or *obscurus* form of Phymodius, or, in lieu of this, to make five or six intergrading sub-species.

In the absence of type specimens it is almost impossible to apply with certainty the specific names already given.

The series before me is far from complete, but it indicates that each form of cheliped described by Dana and others may be attached to any form of carapace; and that carapaces with similar areolation vary in relative width and in the width of the front.

I have thought it desirable to tabulate some of these variations: —

VARIATIONS IN PHYMODIUS UNGULATUS.

Locality.	Sex.	Length in mm.	Width in mm.	Width of front, orbital angle excluded.	Mesogastric region.	Protogastric region.	Lateral teeth.	Chelipeds.	Palms.	Tubercles of palm.	Fingers.	Gape.	Spoons.	Equivalent to.	Figure.
Borabora	♂	16.2	23.3	7.3	Undivided	Without cross markings	Obtuse	Very unequal	Widen much distally	Flat	Little curved	Narrow	Shallow	*ungulatus* Dana and M. Edw.	Pl. 3, fig. 1, 1*a*
Borabora	♀	10.4	14.8	4.8	"	Cross grooves	1–3 obtuse 4–5 acuminate	Equal	Sides subparallel	Sharp	"	"	"		Pl. 4, fig. 2, 2*a*
Oahu	♂	13.5	19.1	7.2	3-divided	"	Obtuse	Unequal	Widen moderately distally	Subacute	Much curved	"	Deep	*ungulatus* var. *gracilis* Dana	
Bonin Ids.	♂	16.0	24	8.5	"	"	1–3 obtuse 4–5 hooked	Little unequal	Sides subparallel	Acute	"	Wide	"	*monticulosus* Dana *arcolatus* A. & W.	Pl. 3, fig. 3, 3*c*
Fakarava	♀	11.2	15.6	6	"	"	Sharp	Equal	"	Spiniform	"	"	"	"	Pl. 4, fig. 3, 3*a*
Fakarava	♂	19.7	28.4	9.5	"	Nodulous	Obtuse	Very unequal	Widen much	Subobsolete	"	"	"	*monticulosus* Alc.	Pl. 4, fig. 1, 1*a*
Tari-Tari	♂	18	25.4	9.2	Scarcely divided	Without cross markings	1–2 obtuse 3–5 subacute	"	Sides subparallel	Subobsolete on larger, acute on smaller.	Little curved	"	Shallow	"	Pl. 4, fig. 4, 4*a*
Tongatabu	♂	14.9	20.8	7.5	3-divided	"	Obtuse	"	Widen much	Obsolete	"	Narrow	"	*obscurus* Lucas	Pl. 3, fig. 2, 2*a*
Oahu	♀	12.5	18.7	6.5	"	"	"	"	Widen little	"	"	"	"		
Honolulu	♀	13	20.5	7.4	Undivided	"	"	"	Widen much	Subobsolete	Much curved	Wide	Deep		Pl. 3, fig. 4, 4*a*

Chlorodopsis venusta, sp. nov.

Pl. 1, Fig. 5.

Carapace with a few, rather long, scattered hairs; legs with similar but more numerous hairs, not concealing the sculpture; chelipeds almost naked.

Posterior third of carapace not areolated. Anterior $\frac{2}{3}$ divided by smooth grooves into regions and sub-regions, which are covered with very numerous sharp granules; these granules become much finer on the posterior third.

Front cut into two rounded denticulate lobes, and outside of each a narrow acute tooth. The two upper fissures of the orbit are faintly marked.

The antero-lateral margin has besides the small orbital angle, four teeth, the last three of which are similar, curved, spiniform. Tooth E of Dana is thick, acute, and fused with the adjacent area 1 L; tooth N bears a few denticles on its sides. 2 L, 3 L, and 4 L are distinct; 5 L and 6 L are only partially separated from each other. 1 L, 3 L, 4 L, and 1 R, the submarginal areas, are high and rough with granules, but not spined. There is a sharp subhepatic denticle. While the outer angle of the basal antennal joint is prolonged into the orbital hiatus, the movable part of the antenna is not excluded from the orbit.

Chelipeds unequal. Arm irregularly spined on anterior margin, sharply rough above, finely granulate outside. Wrist coarsely and sharply granulate, two spines at inner angle. Hands covered with crowded granules, which are finer below and on the inside. Fingers gaping, three teeth on prehensile edge of each, dactylus with denticles outside towards the base.

Legs spinulous above.

Color in spirit mottled, variable, the dark part sometimes forming a variable but bisymmetrical band from front to back. Legs with a few transverse dark stripes. Fingers brown or black with light tips.

Dimensions: — Type ♂, length 6.1 mm., width 10.3 mm.

Distribution: —

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 3 ♂.

Makemo, Paumotus; reef; Oct. 21, 1899; 9 ♂, 6 ♀, (1 ♂ type, Cat. No. 32,851, U. S. N. M.).

Funafuti, Ellice Group; reef; Dec. 24, 1899; 1 juv.

This species is closely related to *C. melanochira* A. Milne Edwards[1] and to *C. wood-masoni* Alcock.[2] It is smaller, less hairy, and more delicately marked than *C. melanochira;* the second antero-lateral tooth (the first after the orbital angle) is not separated from the adjoining area; the fourth and fifth teeth are simple, and the hind part of the carapace is not grooved as in that species. *C. wood-masoni* has fewer denticles on the frontal lobes (7 instead of 15 to 20); a spiniform second tooth; a spine on each of the four submarginal areas; fewer tubercles or granules on the chelipeds.

Chlorodopsis spinipes (Heller).

Pl. 2, Fig. *5*.

Chlorodopsis spinipes Alcock, 1898, **67**, 169.

Rangiroa Id.; Mohican Reef; Sept. 23, 1899; 1 ♂, 1 ♀.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 4 ♀ (3 ovig.).

Makemo, Paumotus; reef; Oct. 21, 1899; 2 ♀.

Borabora Id., Society Group; fringing reef; Nov. 17, 1899; 5 ♂, 8 ♀.

Funafuti, Ellice Id.; reef; Dec. 24, 1899; 1 ♂, 2 ♀.

All the specimens have three antero-lateral spines, besides the orbital spine; just back of the latter is a small subhepatic spine.

Chlorodopsis scabricula (Dana).

Pl. 1, Fig. *3;* Pl. 9, Fig. *5*.

Chlorodopsis scabricula Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 859.

Papeete, Tahiti; reef; Sept. 28, 1899; 2 ♀ immature, 1 young.

These specimens are the same species as the young ♂ from Honolulu, which I referred to *C. scabricula* (*loc. cit.*), and I think that they are probably Dana's *scabricula*.

The four spines of the side margin are similar to each other (E and S of Dana), being smaller than the others. The four lobules adjacent to these spines are high and their summits are denticulated.

[1] Nouv. Arch. Mus. Hist. Nat. Paris, 1873, **9**, 228, pl. 8, fig. 5.

[2] Journ. Asiat. Soc. Bengal, 1898, **67**, 170. Illus. Zool. Investigator, Crust., pt. 7, pl. 37, fig. 7.

In the two larger specimens, the outer angle of the basal antennal joint falls short considerably of the end of the inner suborbital tooth, while in the two smaller specimens that angle reaches the end of the tooth.

Cyclodius ornatus Dana.

Pl. 5, Fig. *5*; Pl. 7, Fig. *8*.

Cyclodius ornatus Dana, Proc. Acad. Nat. Sci. Phil., 1852, 80; Crust. U. S. Expl. Exped., 1852, **1**, 223; atlas, 1855, pl. 12, figs. 11 *a–g*.
Chlorodopsis (Cyclodius) ornata Alcock, 1898, **67**, 171.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀ immature.

Papeete; shore; Nov. 9, 1899; 1 ♂ juv.

Tari-Tari Id.; shore, reef; Jan. 6, 1900; 1 ♀ immature, 1 ♂ juv.

The largest specimens measure as follows: —

♀, Tari-Tari, length 6.7 mm., width 8.8 mm., proportion 1 : 1.31.

♀, Fakarava, length 6 mm., width 7.7 mm., proportion 1 : 1.28.

Lateral teeth N, T, and S are long, slender, and alike; tooth E is similar, but smaller in three specimens; in the young ♂ from Tari-Tari (4 mm. wide) tooth E is not spiniform. Subdivisions of gastric region well marked, except in the last-mentioned specimen. Each middle lobe of the front has 8 or 10 denticles, each lateral lobe 3 or 4.

Fig. 11 *f* of Dana represents the abdomen of a ♀.

Cyclodius gracilis Dana.

Pl. 1, Fig *10*; Pl. 7, Fig. *7*.

Cyclodius gracilis Dana, Proc. Acad. Nat. Sci. Phil., 1852, 80; Crust. U. S. Expl. Exped., 1852, **1**, 224; atlas, 1855, pl. 13, figs. 12 *a* and *b*.

Funafuti; reef; Dec. 24, 1899; 2 ♂, 1 ♀, all young.

The largest specimen, the ♀, measures 3.8 × 5.5 mm., or a proportion of 1 : 1.44. This is a greater width than that given by Dana in the text, but corresponds to his figure. While strongly resembling *C. ornatus*, it is less deeply areolated (specimens of nearly equal size compared), the front as a whole is less prominent, its margin more finely denticulated, its outer lobules are smaller.

Pilodius paumotensis, sp. nov.

Pl. 8, Figs. *2*, *2 a*, *2 b*.

Surface covered with a thin coat of soft, downy hairs, some of which are very long, and most of which proceed from fine granules. Carapace $\frac{2}{3}$ as long as it is broad, regions plainly demarcated. Front convex, with a large, median U-shaped notch; and at the outer end a small, inconspicuous tooth. Margin of front and orbits granulate. The two notches in the superior margin of the orbit are small; the one on the outer side is deep and V-shaped; outer angle of orbit not prominent. Behind it, on the antero-lateral margin, are 4 spine-pointed teeth; the first is low, the other three are of good size; all have a few denticles on their sides; the last two teeth or spines are equally prominent, the carapace having the same width at these points. Parallel to the posterior margin, a row of fine bead granules. The postero-lateral surface, over which the posterior legs fold, is naked and crossed by transverse and granulated lines. The basal segment of the antenna touches with its inner angle the bent-down angle of the front; the outer angle of the segment does not reach the end of the inner orbital angle; the flagellum stands in the orbital hiatus.

Chelipeds unequal, especially in the ♂. Exposed surface granulate and hairy like the carapace, except the lower part of the palms, which is smooth and naked. Anterior edge of arms granulate, and at the proximal extremity one very short, blunt spine. A small spine at inner angle of wrist. Palms stout, with convex lower margin. Basal half of dactylus rough and hairy. Fingers gaping, prehensile edges with a few large teeth, tips very broad and deep spoons. Ambulatory legs spinulous above.

All the specimens in alcohol are covered on the dorsal aspect with small dark color spots.

Dimensions: — ♂ type, length 5.2 mm., width 8 mm.

Distribution: —

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 3 ♂, 3 ♀.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂ type, 1 ♀ (Cat. No. 32,852, U. S. N. M.).

This species has much in common with *P. pubescens* Dana,[1] but differs from it in having the carapace and chelipeds finely rough, instead of the

[1] Crust. U. S. Expl. Exped., 1852, **1**, 217; atlas, 1855, pl. 12, fig. 6 *a–d*.

carapace smooth and the chelipeds coarsely rough; in the deep median sinus of the front; in the denticulation of the lateral spines; in the lack of prominent spines on the anterior border of the arm.

The genus Pilodius stands very near Pilumnus and Chlorodopsis; it has the aspect of a Pilumnus, but the fingers are spoon-shaped instead of pointed; the carapace is not so much subdivided into areolets as in Chlorodopsis, where the antero-lateral areolets are exceptionally rough and high. As for the arrangement of antennae and orbits, it does not in Pilodius differ much from some species of Chlorodopsis, although the movable part of the antenna is excluded from the orbit in the typical species of the latter genus.

Cymo melanodactylus De Haan.

Cymo melanodactylus Alcock, 1898, **67**, 174.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 6 ♂, 9 ♀ (4 ovig.).
Borabora Id., Society Group; fringing reef; Nov. 7, 1899; 1 ♂, 1 juv.
Tari-Tari Id.; shore; Jan. 6, 1900; 1 ♂, 1 ♀.

Cymo quadrilobatus Miers.

Pl. 1, Fig. 7

Cymo quadrilobatus Alcock, 1898, **67**, 175.

Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 ♂, 1 juv.
Funafuti, Ellice Ids.; shore; Dec. 25, 1899; 1 ♀ ovig.

Ozius rugulosus Stimpson.

Ozius rugulosus Stimpson, Proc. Acad. Nat. Sci. Phil., 1857, **9**, 34.

Nomuka Iki, Tonga Group; shore; Dec. 2, 1899; 2 ♂.

Ozius guttatus Milne Edwards.

Ozius guttatus Milne Edwards, Hist. Nat. Crust., 1834, **1**, 406. A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, 1873, **9**, 239, pl. 11, fig. 1.

Tongatabu; shore; Nov. 29, 1899; 1 ♂, 1 carapace.

Ozius hawaiiensis Rathbun.

Ozius hawaiiensis Rathbun, Proc. U. S. Nat. Mus., 1902, **26**, 76, text figs. 3 & 4; Bull. U. S. Fish Comm. for 1903 (1906), part 3, 862.

Nukuhiva, Marquesas Ids.; shore, seine; Sept. 15–17, 1899; 1 ♂.
Rangiroa Id.; beach; Sept. 21, 1899; 1 ♂.
Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 4 ♀.
Makemo, Paumotus; reef; Oct. 21, 1899; 5 ♂, 19 ♀.
Kusaie, Carolines; reef; Feb. 8, 1900; 5 ♂, 4 ♀.

Ozius tricarinatus, sp. nov.

Pl. 2, Fig. *3*.

Carapace $1\frac{3}{5}$ times as wide as long, very convex fore and aft, moderately convex from side to side; interregional depressions deep, surface irregularly granulate and coarsely punctate, and near the antero-lateral margins eroded. Lateral regions crossed by three blunt carinae; the posterior of these is very low and runs from the last side tooth somewhat obliquely inward toward the widest part of the mesogastric region; the next ridge is more oblique and begins at the base of the penultimate tooth; the anterior ridge begins at the next tooth and is directed toward the middle of the orbit; it is broken in two at the middle, the two parts not in the same line.

The edge of the front has a submarginal groove and is cut into four rather prominent subequal lobes, the median sinus narrower than the lateral; outer lobe separated from orbital angle by a furrow.

Antero-lateral margin blunt, cut into five teeth, the first of which is separated from the orbital margin by a broad furrow; the first two teeth or lobes are long, shallow, and subequal; the third is as long but more distinctly angled; the fourth is shorter and most dentiform and stands at the widest part of the carapace; fifth tooth much less prominent.

The type and only adult specimen is a ♀ in which the right cheliped or the one which should be the larger, as it has the stout tooth at the base of the dactyl, is abnormally reduced, being much shorter and also narrower than the left one. This last is $1\frac{1}{2}$ times as long as carapace; surface of wrist and hand reticulated, punctate, and covered with flattened granules.

Dimensions: — Length of type ♀ 37.2 mm., width 59.5 mm.

Distribution: —

Nukuhiva, Marquesas Ids.; shore, seine; Sept. 15–17, 1899; 1 ♀ (type), 1 ♀ juv. (Cat. No. 32,853, U. S. N. M.).

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂ juv.

In the two young specimens, the granules of the surface are almost effaced, but the carapace appears more eroded, the teeth of the front are less prominent, those of the sides more prominent than in the adult. The chelipeds are very unequal, the fingers of the larger one gape narrowly.

In the shape and number of the front and side teeth this species resembles *O. verreauxii* Saussure, which, however, is flatter and has only one transverse crest.

Pilumnus andersoni de Man.

Pilumnus andersoni Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 863.

Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 ♂, 1 ♀.

Ponape, Caroline Ids; reef; Feb. 11, 1900; 2 ♂, 3 ♀ (1 ovigerous).

The specimens from Ponape have the first of the 3 lateral spines further from the orbit than in typical *andersoni*, and the antero-lateral margin correspondingly longer. All of the 7 individuals are small, the largest measuring 7.3 mm. in width.

Pilumnus cursor A. Milne Edwards.

Pilumnus cursor Alcock, 1898, **67**, 195.

Funafuti; reef; Dec. 24, 1899; 1 immature ♀, which agrees with the description given by de Man[1] but has shorter legs than represented in the figure by A. Milne Edwards.[2] The specimen is only 4.2 mm. long, the second or longest ambulatory leg is 7.5 mm. long.

[1] Arch. f. Naturg., 1887, **53**, part 1, 299.

[2] Nouv. Arch. Mus. Hist. Nat., 1873, **9**, pl. 9, fig. 4.

Pilumnus globosus Dana.

Pilumnus globosus Dana, Proc. Acad. Nat. Sci. Phil., 1852, 81; Crust. U. S. Expl. Exped., 1852, **1**, 236; atlas, 1855, pl. 13, fig. 10. De Man, Notes Leyden Mus., 1890, **12**, 59, pl. 3, fig. 3.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 adult ♀, little smaller than the type, measuring 6.2 mm. long and 8 mm. wide. It differs a little from de Man's description. The hairs of the carapace arise from rather large and irregular punctae; granules few. The margin of the front continues the arch of the antero-lateral borders, and has a wide emargination. The three lateral projections are not granules, but small spines. Palms granulate all over the outer surface, but not thickly so; fingers grooved; basal half of dactylus granulate in both chelae, and one or two granules on outer surface of immovable finger. Fingers light brown; the color line on the propodus is at right angles to its lower margin; the pollex is as broad at base as it is long.

Pilumnus tahitensis de Man.

Pilumnus tahitensis de Man, Notes Leyden Mus., 1890, **12**, 61, pl. 3, figs. 4, 4 *a*, 4 *b*.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂, 2 ♀.

The largest specimen, an ovigerous ♀, is smaller than the types, measuring 6.8 mm. long by 9 mm. wide. The chelipeds are equal in all the specimens.

Actumnus integerrimus (Dana).

Pl. 1, Fig. *12;* Pl. 8, Figs. *3*, *3 a*, *3 b*.

Actaeodes? integerrimus Dana, Crust. U. S. Expl. Exped., 1852, **1**, 201; atlas, 1855, pl. 11. fig. 7.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♀.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀.

Carapace convex, not much broader than long, thick; side margins entire, granulate, with faint traces of one or two teeth; surface smooth to the naked eye with scarcely any trace of regions, and with a few scattered hairs; under the lens the anterior two thirds is seen to be very sparsely and finely granulous.

Front with two oblique lobes separated by a median V, outer angles

bent down, touching the basal joint of antenna. Eyes large; orbital notches obscure above, absent below outer angle.

Palatal ridge present, but not strong.

Chelipeds unequal, rough with sharp granules; lower surface of larger hand almost smooth; fingers spoon-shaped, rough at base, gaping, light-colored. In the smaller specimen (Papeete) the outer face of the hand is largely smooth. Legs almost smooth, sparsely hairy, meropodites slightly spinulous above, dactyli with long slender point.

Dimensions:—Fakarava, length 3.3, width 4.5 mm.; width of front 16 mm.

I think that this is Dana's species, as the carapace appears smooth and entire, but the hairs do not form the pattern shown in his figure.

Eriphia sebana (Shaw).

Cancer sebanus Shaw, in Shaw & Nodder, Nat. Misc., 1803, **15**, pl. 591.
Eriphia sebana Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, p. 865.

Rangiroa Id.; shore; Sept. 21, 22, 1899; 2 ♂, 1 ♀; "eyes vermilion, ocellus black."

Makatea Id.; shore; Oct. 6, 1899; 1 ♀.

Fakarava, Paumotus; reef, sea beach; Oct. 13, 1899: 1 ♀ ovig.

Makemo Id., Paumotus; Oct. 20, 1899; 1 ♂.

Makemo Id., Paumotus; reef; Oct. 21, 1899; 1 ♂ juv.

Nomuka Iki, Tonga Group; shore; Dec. 2, 1899; 1 ♂, 1 ♀.

Tarawa Id., Gilbert Group; shore; Jan. 3, 1900; 1 ♀.

Kusaie, Caroline Ids.; reef; Feb. 8, 1900; 2 juv.

Manga Reva, Motus; Feb. 3, 1905; 1 ♀ ovigerous.

Eriphia scabricula Dana.

Eriphia scabricula Dana, Crust. U. S. Expl. Exped., 1852, **1**, 247; atlas, 1855, pl. 14, fig. 5*a* and *b*.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀.

Trapezia[1] rufopunctata (Herbst).

Trapezia rufopunctata Alcock, 1898, **67**, 222.

Makemo, Paumotus; reef; Oct 21, 1899; 2 ♂, 2 ♂ ovig.

Funafuti, Ellice Ids.; shore; Dec. 25, 1899; 2 ♀ (1 ovig.)

[1] **Trapezia** Latreille 1825 = **Grapsillus** MacLeay, 1838. **Trapezia**, derived from *τράπεζεύς*, table-like, may not conflict with **Trapezium** (Humphrey, 1797), from *τράπέζιον* a little table.

Trapezia cymodoce (Herbst).

The variations shown in the collection from the South Pacific Islands make it necessary to unite under one specific name the many forms of the *cymodoce ferruginea* group. (*Cf.* Alcock, **67**, pp. 219–222.)

Trapezia cymodoce dentata (MacLeay).

Trapezia ferruginea dentata Ortmann, Zool. Jahrb., Syst., 1897, **10**, 204.

Rangiroa, Paumotus; beach; Sept. 21, 1899; 1 ♂.

Fakarava, Paumotus; outer reef; Oct. 12, 1899; 1 ♂.

Makemo, Paumotus; reef; Oct. 21, 1899; 4 ♂, 6 ♀ (5 ovig.).

Borabora, Society Group; fringing reef; Nov. 17, 1899; 1 ♀ ovig.

Funafuti, shore; Dec. 25, 1899; 1 ♀, ovig.

These are but slightly removed from *T. cymodoce*; they lack the acute upper border on the palm, and the hairy coating on the outer face of the palm.

Funafuti; reef; Dec. 24, 1899; 5 ♂, 8 ♀ (4 ovig.), 3 juv.; varying toward *T. cymodoce*. The outer face of the chelipeds is densely covered with downy hair, but the upper edge of the palms is obtuse, and the teeth of the front are not deeply separated.

Trapezia cymodoce ferruginea Latreille.

Trapezia ferruginea Alcock, 1898, **67**, 220.

Rangiroa, Paumotus; beach; Sept. 21, 1899; 2 ♀ ovig.

Fakarava, Paumotus; outer reef; Oct. 12, 1899; 1 ♀ ovig.

Makemo, Paumotus; reef; Oct. 21, 1899; 2 ♂, 1 ♀ ovig.

Funafuti, Ellice Id.; reef; Dec. 24, 1899; 1 ♂.

Funafuti; shore; Dec. 25, 1889; 2 ♀ (1 ovig.). Variety with palms hairy outside, but not acute above.

Rangiroa Id.; Mohican reef; Sept. 23, 1899; 1 ♂; and

Easter Island; shore; Dec, 20, 1904; 1 ♂, 1 ♀ ovig. Variety with chelipeds covered with fine spots.

Rangiroa Id.; Mohican reef; Sept. 23, 1899; 1 ♂, 1 ♀ ovig., holding in the right claw a young anemone. Variety with dark band across the front, palms reticulated and legs spotted. This is the *guttata* form of Alcock, **67**, p. 220.

The following specimens are similar to the last, but the spots on the legs are absent, perhaps obliterated from long preservation:

Fakarava, Paumotus; shoal in lagoon; Oct. 11, 1899; 1 ♂, 1 ♀ ovigerous.

Borabora Id., Society Group; fringing reef; Nov. 17, 1899; 1 ♂.

Trapezia cymodoce areolata Dana.

Trapezia ferruginea var. **areolata** Alcock, 1898, **67**, 221.

Vavau; reef; Dec. 5, 1899; 1 ♂, 1 ♀ ovig.

Funafuti; reef; Dec. 24, 1899; 3 ♂, 2 ♀ (1 ovig.).

Trapezia cymodoce maculata (MacLeay).

Trapezia maculata Alcock, 1898, **67**, 221.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♀ immature; spots few.

Variety: — At the same locality, an immature ♀ agreeing entirely in form with the above, but with quite different markings; the carapace and chelipeds are covered with reticulating brown (in alcohol) lines, legs dotted with minute spots of brown.

Of the form *maculata*, it may be said that it usually has the prominent front, the sharp side-tooth, the carpal spine, and the brilliant spots on carapace, chelipeds, and legs; but these characters run into those of the *intermedia* form, which has a less prominent front, blunt side-tooth, blunt-angled wrist, reticulated palms, while carapace and legs are spotted.

Trapezia digitalis speciosa Dana.

Trapezia speciosa Dana, Crust. U. S. Expl. Exped., 1852, **1**, 253; atlas, 1855, pl. 15, fig. 1.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂, 1 ♀ ovig.

Fakarava, Paumotus; outer reef; 10 ♂, 10 ♀ (9 ovig.).

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 1 ♀.

Trapezia digitalis bella Dana.

Trapezia bella Dana, Crust. U. S. Expl. Exped., 1852, **1**, 254; atlas, 1855. pl. 15, fig 2.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂.

Tetralia glaberrima (Herbst).

Tetralia glaberrima Alcock, 1898, **67**, 223.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂, 2 ♀ ovig.
Fakarava, Paumotus; outer reef; Oct. 12, 1899; 4 ♂, 7 ♀ (3 ovig.).
Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 6 ♀ ovig.

Domecia hispida Eydoux and Souleyet.

Domecia hispida Alcock, 1898, **67**, 230.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 3 ♀ (1 ovig.).
Funafuti, Ellice Is.; reef; Dec. 24, 1899; 1 ♂, 2 ♀ (1 ovig.).

Lybia caestifera (Alcock).

Melia caestifer Alcock, 1898, **67**, 231. Illus. Zool. Investigator, Crust., 1899, part 7, pl. 38, fig. 4.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♂.

PORTUNIDAE.

Caphyra rotundifrons (A. Milne Edwards).

Pl. 1, Fig. 4.

Camptonyx rotundifrons A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat. Paris, 1869, **5**, 156, pl. 7, figs. 11, 12.

Papeete, Tahiti; reef; Sept. 28, 1899; 1 ♀ ovig.

Catoptrus nitidus A. Milne Edwards.

Catoptrus nitidus Alcock, 1900, **69**, 387.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♀.
Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 ♂.

Portunus (Achelous) granulatus (Milne Edwards).

Neptunus (Achelous) granulatus Alcock, 1899, **68**, 45.

Fakarava Id.; Paumotus; outer reef; Oct. 12, 1899; 1 ♂.
Borabora, Society Ids.; shore and fringing reef; Nov. 17, 1899; 1 ♂, 1 ♀.
Funafuti, Ellice Ids.; shore, seine; Dec. 24, 1899; 2 ♂, 1 ♀.
Butaritari, Gilbert Group; lagoon, surface; Jan. 6, 1900; 1 juv.
Mela, Carolines; shore, seine; Feb. 16, 1900, 3 ♀ (1 ovig.).

Callinectes alexandri, sp. nov.

Pl. 2, Fig. *1;* Pl. 9, Figs. *3, 3 a, 3 b.*

Young male. Extreme width of carapace about $2\frac{2}{5}\times$ the median length. Regions well marked, as well as the two areolae at the inner angle of the branchial region. Granules of dorsal surface squamiform and conspicuous; most scattered on the anterior third, finest and most crowded on the posterior third. The granules of the customary ridges (two gastric and one branchial) are more beadlike. The median length of the intramedial region, or that part of the gastric region situated behind the second ridge, is nearly $\frac{1}{2}$ its anterior width.

Frontal teeth four, besides the orbital pair. Median pair tuberculiform, not more than $\frac{1}{3}$ the area of the triangular, obtuse, outer pair. Inner orbital tooth lobiform and a little less advanced than the median teeth. Superior fissures of orbit well marked, but closed; inner suborbital lobe subacute, not very prominent.

The outer orbital tooth, or the first tooth of the lateral series, is equilateral or subacute. Teeth 2 to 7 inclusive are saw-teeth, that is, shorter on the anterior than on the posterior margin; the second, third, and fourth are acute, the fourth, fifth, and sixth are acuminate and slightly concave on the posterior margin. Eighth tooth curved forward, acuminate. The midrib of the ninth projection, or the lateral spine, is quite transverse; its length is about $\frac{1}{5}$ of the carapace, exclusive of the lateral spines.

The shape of the abdomen of the young male is probably not that of the adult; the sixth segment tapers gradually to the distal end, the seventh is equilateral.

Chelipeds very finely rugose, the costae of wrist and hand prominent and more closely granulate; three strong curved spines on the anterior margin of the merus; posterior margin unarmed. The outer spine of the carpus is well developed, though much smaller than the inner. Of the two spines of the palm, the proximal is curved, the distal is very slender.

Dimensions: — Length of ♂, type, 14.8 mm.; entire width, 35.7 mm.; length of lateral spine, 5 mm.

Distribution: —

Papeete, Tahiti; shore; Nov. 9, 1899; 1 ♂, juv., type (Cat. No. 32,854, U. S. N. M.).

Suva, Fijis; shore; Dec. 13, 1899; 1 ♀, juv.

Thalamonyx parvidens, sp. nov.

Pl. 5, Fig. *9*.

Carapace not $\frac{2}{3}$ as long as broad ; surface minutely granulate and covered with fine hairs easily rubbed off. Besides the three gastric ridges, the last of which is continued to the posterior lateral tooth, there is a short ridge on each branchial region.

Front prominent, convex, a well-marked median V.

Antero-lateral borders little oblique; of the five teeth, the last two are smaller than the others, the fourth being the shortest, the fifth spiniform.

Diameter of orbit about $\frac{1}{3}$ the inter-orbital space.

Chelipeds granulate, especially the arm and wrist. Arm rugose-denticulate above; inner border with three graduated teeth and numerous denticles. Wrist costate, three of the costae terminating in low, blunt projections; a strong spine at inner angle. Chelae very unequal; two costae on upper surface, the inner one with a spine at its middle, outer one ending in a tubercle not far from the middle in the ♂ ; in a sharp spine in the ♀, and occasionally in the ♂ ; spine near wrist usually blunt in the ♂, sharp in the ♀.

Merus of last pair of legs $2\frac{1}{2}\times$ as long as broad.

Sixth segment of ♂ abdomen $\frac{2}{3}$ as long as broad.

Dimensions : — Length of type ♂, 15.2 mm. ; width, 18.7 mm.

Distribution : —

Truk, Carolines; shore, in seine; Feb. 16, 1900; 12 ♂, 8 ♀ (1 ovig.). 1 ♂ is type (Cat. No. 32,855, U. S. N. M.).

Mela, Carolines; shore, in seine; Feb. 16, 1900; 9 ♂, 8 ♀ (3 ovig.). One of the latter is only 10.3 mm. in width.

This species differs from *T. danae* (A. Milne Edwards)[1] and *T. gracilipes* A. Milne Edwards[2] in the wider carapace, unequal side-teeth, and smoother chelipeds, and from *T. gracilipes* in the smaller orbit.

Thalamita crenata Rüppell.

Thalamita crenata, Alcock, 1899, **68**, 76.

Borabora, Society Ids. ; shore and fringing reef; Nov. 17, 1899; 2 ♂, 5 ♀ (2 ovig.).

[1] Nouv. Arch. Mus. Hist. Nat. Paris, 1869, **5**, 153, pl. 7, figs. 6, 7.
[2] Nouv. Arch. Mus. Hist. Nat. Paris, 1873, **9**, 169, pl. 4, fig. 3.

Thalamita coeruleipes Jacquinot.

Thalamita coeruleipes Jacquinot, in Jacquinot & Lucas, Voyage au Pole Sud, Zool., **3**, Crust., 1853, 53; atlas, 1852 (?), pl. 5, fig. 6.

Fakarava Id., Paumotus; reef; Oct. 12, 1899; 1 ♂; also Society Ids., A. Garrett coll. (U. S. N. M.).

This species is very near *T. prymna* (Herbst), but the fourth lateral tooth is not much smaller than the other teeth.

Thalamita admete Herbst.

Cancer admete Herbst, Natur. d. Krabben u. Krebse, 1803, **3**, part 3, 40, pl. 57, fig. 1.
Thalamita admeta Alcock, 1899, **68**, 82 (part). Borradaile, Fauna, Maldive Arch., 1902, **1**, 202 (var. A.).
Thalamita admete Rathbun, Bull. U. S. Fish Comm. for 1903 (1906), part 3, 874.

Fakarava Island, Paumotus; outer reef; Oct. 12, 1899; 10 ♂, 13 ♀, 8 of which are ovigerous.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂, 1 ♀, 2 juv.

Tongatabu; reef and shore; Nov. 30, 1899; 1 ♂, 1 ♀.

Funafuti, Ellice Ids.; reef; Dec. 24, 1899; 1 ♀ ovig., 1 juv.

Mela, Carolines; shore, in seine; Feb. 16, 1900; 1 ♀ shedding its shell.

The fourth side tooth is smaller, more rudimentary, than in specimens recorded in 1906 (*loc. cit.*), but otherwise there are no differences, so that there is perhaps no dividing line between the form with the 4th tooth almost undiscernible and the typical form with a well-developed tooth.

Thalamita gardineri Borradaile, variety.

Thalamita gardineri Borradaile, Fauna Maldive Arch., 1902, **1**, 205, text fig. 36.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♂, 1 ♀ (ovig.).

Length of ♂ 12.1, width 19.5, fronto-orbital width 14.2 mm.

Differs from typical *gardineri* as follows: —

Carapace wider; length .62 of width instead of .76 of width. This additional width of carapace, although without an increase in fronto-orbital distance, gives the crab less of a *Charybdis*-like aspect.

The inner surface of the palm is almost smooth; very fine squamiform markings are visible with a lens; the longitudinal ridge through the middle is smooth in the larger cheliped, obscurely granulate in the smaller. (Chelipeds of ♂ wanting.)

Thalamitoides quadridens A. Milne Edwards.

Thalamita (Thalamitoïdes) quadridens A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat., 1869, **5**, 147, pl. 6, figs. 8–15.

Thalamitoides quadridens de Man, Arch. f. Naturg., 1887, **53**, 1, p. 332.

Jaluit; lagoon; Jan. 1, 1900; 1 ♀ ovigerous, 14.5 mm. in width.

Carupa laeviuscula Heller.

Carupa laeviuscula Heller, Verh. zool. bot. Ges. Wien, 1862, **12**, 520; Reise Novara, Crust., 1865, **27**, pl. 3, fig. 2; Alcock, 1899, **68**, 26.

Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♂.

INACHIDAE.

Menaethius monoceros (Latreille).

Menaethius monoceros Alcock, 1895, **64**, 197.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 2 ♀.
Funafuti, Ellice Id.; reef; Dec. 24, 1899; 1 ♀.
Tari-Tari Id.; shore, reef; Jan. 6, 1900; 1 ♂.
Truk, Carolines; shore, seine; Feb. 16, 1900; 2 ♂, 1 ♀.
Mela, Carolines; shore, seine; Feb. 16, 1900; 2 ♂.

Halimus borradailei, nom. nov.

Hyastenus elegans var. **tenuicornis** Borradaile, Proc. Zool. Soc. London, 1900, 574, pl. 40, fig. 2. Not **Hyastenus (Chorilia) tenuicornis** Pocock, Ann. Mag. Nat. Hist., 1890, (6) **5**, 76.

The form described by Borradaile as a variety of *H. elegans* Miers,[1] it seems to me should be regarded as a distinct species, because of the different build of the postocular lobes, the great width between the horns at their base, as well as the different ornamentation of the dorsum.

On the reef at Funafuti, Dec. 24, 1899, was taken an immature ♀ about ⅓ the size of Borradaile's examples from Rotuma. Of the six gastric tubercles in his figure, only the outer pair are evident in our individual. In other respects it agrees well enough with the figure, allowing for the difference in size.

[1] "Challenger" Rept., 1886, **17**, 58, pl. 6, fig. 3.

Perinea tumida Dana.

Perinea tumida Dana, Crust. U. S. Expl. Exped., 1852, **1**, 114; atlas, 1855, pl. 4, fig. 1 *a–f*.

Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 2 ♀ gravid.

Schizophrys aspera (Milne Edwards).

Schizophrys aspera Alcock, 1895, **64**, 243.

Funafuti, Ellice Ids.; shore; Dec. 25, 1899; 1 ♀ juv.

Lophomicippa, gen. nov.

(λόφος, crest, in allusion to the legs; **Micippa**, a generic name.)

Carapace suboblong, high, rounded behind; front broad, almost vertically deflexed. Eye-stalks long, corneae large, oval, chiefly ventral in position; eyes filling the orbits, the margins of which are for the most part entire, the broad basal joint of the antenna bidentate. Antennae exposed, 2nd and 3rd joints small.

Buccal cavity widened anteriorly. Merus of outer maxillipeds broader than the ischium, its external angle expanded, and its internal angle notched for the insertion of the palpus.

Chelipeds of adult ♀ slender, feeble, shorter than the carapace. Legs diminishing rapidly in length, the merus joints broadly expanded, forming together a deep, continuous border around and below the sides of the carapace and concealing the chelipeds.

This genus unites the most striking characters of Micippa Leach[1] of the Indo-Pacific, and Hemus A. Milne Edwards[2] of tropical America.

It has the carapace of the former and the legs of the latter. The orbits of Micippa are more tubular, while the carapace of Hemus is strongly narrowed in front and the second and third joints of the antennae are very large.

Type, and only species,

Lophomicippa limbata, sp. nov.

Pl. 5, Fig. *3*; Pl. 6, Figs. *1–1 g*.

Surface pubescent.

Carapace as wide as its superior length, narrowing a little anteriorly,

[1] Zool. Misc., 1817, **3**, 15.

[2] Miss. Sci. Mexique, Crust., 1875, 88.

surface uneven, highest along the median line. hepatic region depressed, its margin crenulate. A small spine at the postero-lateral angle, behind it a spinule or granule; posterior margin bearing three lobes, the middle one with four granules on its border, the lateral lobes smooth, naked, and rounded, projecting downward between the bases of the last two legs.

Front steeply inclined, its lower margin convex in front view, concave in ventral view, and fringed with long hair; at either end of this margin there is a small sharp forward-pointing spine; side margins spinulous or granulous.

Basal joint of antenna large, smooth, with the exception of a crenulated crest near and parallel to its union with the carapace; this crest ends outwardly in a small tooth followed by a second tooth on the margin of the orbit. Peduncle of antenna not reaching lower margin of front, fringed with long hair, second joint expanded, third joint short, cylindrical.

Chelipeds smooth, shining; in the ♀ the chelae taper distally. In the legs of the first pair the merus is longer than the sum of the next three joints, its outer surface is concave, and it bears a small spine at the lower distal angle. Carpus short, broad, propodus elongate, dactylus half as long and strongly curved. Size of the merus diminishing from the first to the fourth leg, that of the fourth being about half as long and $\frac{2}{3}$ as wide as that of the first leg, and a little shorter than the sum of the next three joints.

Abdomen of ♀ thin, flat, 7-jointed.

Dimensions: — ♀, length, from lower edge of front, 9.2 mm.; greatest width, 8 mm.; width at postorbital angles, 5.5 mm.

Type locality: — Makemo, Paumotus; reef; Oct. 21, 1899; 1 ♀ ovigerous (Cat. No. 32,856, U. S. N. M.).

PARTHENOPIDAE.

Parthenope (Parthenope) melana, sp. nov.

Pl. 5, Fig. *6;* Pl. 6, Fig. *2.*

Carapace ovate-pentagonal, little broader than long. A continuous longitudinal elevation on the gastric and cardiac regions; an oblique elevation on the branchial region. A deep hollow at the inner angle of the branchial region; a furrow either side of the hepatic region. The more elevated portions are covered with berried tubercles; depressions for the most part smooth.

Front inclined at an angle of about 45°; edge quinquedentate; either side of the blunt median tooth, there is a small tooth, and behind it a broad shallow tooth. Constriction behind the orbits not sufficient, I think, to place the species in the subgenus Rhinolambrus.

Hepatic region well marked.

Antero-lateral margin of branchial region armed with six tubercles, this line being partially extended backward and upward on the postero-lateral margin by three tubercles, the last of which is the largest tubercle of the carapace. Posterior margin with two lines of tubercles, the terminal tubercle of the submarginal row being the largest.

Chelipeds about $2\frac{1}{3}$ times as long as the carapace. Arm and hand margined with irregular teeth and tubercles which are granulated or berried. Upper surface of arm with a row of tubercles; upper and inner surfaces of hand almost smooth. Outer surface of arm, wrist, and hand and inner surface of arm tuberculous.

The slender ambulatory legs have the dactyli longer than the propodi.

Dimensions: — Length of ♀ 20 mm., width 21.3 mm.

Type locality: — Mela, Carolines; shore, seine; Feb. 16, 1900; 1 ♀ (Cat. No. 32,857, U. S. N. M.).

This species is very near *P. lippa* (Lanchester)[1] from the Malay Peninsula, but differs in the shorter propodal joints of the ambulatory legs, the shorter front, the small size of the postero-lateral protuberance, the presence of an oblique line of branchial tubercles.

CALAPPIDAE.

Calappa hepatica (Linnaeus).

Calappa hepatica Alcock, 1896, **65**, 142.

Borabora, Society Islands; shore and fringing reef; Nov. 17, 1899; 1 ♂, 1 ♀.

Lifu; shore; Dec. 13, 1899; 3 ♂.

Tari-Tari Island; shore; Jan. 6, 1900; 1 ♂.

[1] Proc. Zool. Soc. London, 1901, part 2, 537, Pl. 33, fig. 1.

Matuta banksii Leach.

Matuta banksii Alcock, 1896, **65**, 158, description, not **M. picta** Hess.

Nukuhiva, Marquesas Ids.; shore and seine; Sept. 15, 17, 1899; 2 ♂, 5 ♀, 2 juv.

LEUCOSIIDAE.

Nucia gelida, sp. nov.

Pl. 5, Fig. *4;* Pl. 9, Figs. *2–2 c.*

Entire surface frosted with granules.

Carapace broader than long, roughly hexagonal with the pterygostomian regions protuberant; covered with tubercles, which toward the front and sides become gradually elongated, forming blunt conical spines. Longest spines at lateral angle, and at pterygostomian angle.

Front formed by two teeth separated by a furrow, and bearing each a tubercle on the margin.

Orbit not concealing the eye, armed with a supraorbital and a sharp post-orbital spine. A spine at the angle of the buccal cavity, and four below the orbit. Two tubercles on the exognath of the outer maxilliped.

Chelipeds of ♀ equal, merus having a few conical spines disposed in a row along the outer margin and in a transverse series on the distal half of the upper surface. Wrist and hand with a few tubercles above; fingers with longitudinal lines of granulations.

The merus and carpus joints of the legs have each two protuberances on the upper margin; dactyli elongate, regularly tapering, horny tips transparent.

♀, Length 2.5 mm., width 3.5 mm.

Type locality:— Fakarava Id., Paumotus; outer reef; Oct. 12, 1899; 1 ♀ ovigerous. (Cat. No. 32,858, U. S. N. M.)

Leucosides whitmeei (Miers).

Leucosia whitmeei Alcock, 1896, **65**, 224.

Mela, Carolines; shore, seine; Feb. 16, 1900; 1 ♂.

PANAMIC REGION.

OCYPODIDAE.

Ocypode gaudichaudii Milne Edwards and Lucas.

Ocypode gaudichaudii Milne Edwards and Lucas, D'Orbigny's Voy. l'Amér. Mérid., 1843, **6**, part 1, 26; 1857, **9**, pl. 11, fig. 4.

Chatham Id., Galapagos; shore; Jan. 8, 1905; 2 ♀.

GRAPSIDAE.

Grapsus grapsus (Linnaeus).

Grapsus grapsus Rathbun, Bull. U. S. Fish Comm. for 1900 (1901), **2**, 16, and synonymy.

Chatham Island, Galapagos Ids.; shore; Jan. 4, 1905; 1 ♂, 3 ♀.

Planes minutus (Linnaeus).

Nautilograpsus minutus Kingsley, Proc. Acad. Nat. Sci. Phil., 1880, 202.

South of Gulf of California; station 4587, surface; Oct. 12, 1904; 1 ♀.
Off Guatemala; station 4605, surface; Oct. 17, 1904; 1 ♂.
Off Peru; station 4649, surface; Nov. 10, 1904; 2 ♀.

PILUMNIDAE.

Micropanope taboguillensis, sp. nov.

Pl. 1, Fig. *8*; Pl. 7, Figs. *3,3a*.

Carapace subhexagonal, of moderate width, about $1\frac{1}{3}\times$ as broad as long; anterior half inclined downward; posterior half flat; in front of cardiac region the regions are distinct, the protogastric areas anteriorly subdivided longitudinally. Surface rough with granulated rugae on anterior two thirds, posteriorly nearly smooth. Front narrow, less than $\frac{1}{3}$ the width of the carapace, prominent, divided by a large V-shaped notch into 2 lobes with oblique and slightly concave margins. Edge of front, orbits, and anterolateral margins finely granulate. Outer angle of orbit not prominent nor dentiform. Tooth E of Dana small and distant from the orbit, the intervening space straight. Teeth N, T, & S of good size, subequal, acute, N somewhat curved. A small subhepatic clump of granules.

Outer sinus of orbit V-shaped; tooth at inner angle thickened.

Chelipeds strong, unequal, rough with sharp granules which are very large on the wrist and hand.

Inner angle of wrist blunt, not produced; below it a sharp tooth; a deep sulcus parallel to distal margin. On the upper surface of the hand are two deep sulci; on the lower surface the granules are smaller and more depressed; inner surface with a coarsely granulated area, reaching from the middle to the upper margin. Fingers deeply sulcate, dactylus granulate on basal portion in large cheliped, and on basal half in small cheliped. Fingers not gaping in small cheliped, slightly gaping in large one; large dactyl with a strong basal tooth.

Legs spinulous. The merus has a single row of spinules on anterior margin, the carpus and propodus each three rows, but on these joints the spinules are obscured by hairs; upper surface of merus almost smooth, of next two joints more or less rough with sharp granules.

Dimensions: — ♂ type, length 7 mm., width 10 mm.; fronto-orbital width 5.7 mm.. frontal width 3 mm.

Type locality: — This species inhabits Taboguilla Id., Panama. The type, a ♂, was taken at low tide at a depth of one fathom, from coral, Oct. 31, 1904 (Cat. No. 32,859, U. S. N. M.). A much smaller ♂ was taken between tide marks, Oct. 31, 1899.

The nearest species is *M. truncatifrons* Rathbun[1] from deep water in the Caribbean region, which has a horizontal front, the carapace with fewer horizontal markings and rougher behind, the inner prominences of the wrist spiniform, the legs much more slender.

Xanthodius sternberghii Stimpson.

Xanthodius sternberghii Stimpson, Ann. Lyc. Nat. Hist. N. Y., 1859, **7**, 52.

Taboguilla Id.; between tide marks; Oct. 31, 1899; 5 ♂, 7 ♀.
Perico Id., Panama; Oct. 26, 1904; 1 ♂.

Cycloxanthops vittatus (Stimpson).

Xantho vittata Stimpson, Ann. Lyc. Nat. Hist. N. Y., 1860, **7**, 206.

Cycloxanthus vittatus A. Milne Edwards, Miss. Sci. au Mexique, Zool., 1879, pt. 5, **1**, 259, pl. 46, fig. 5.

Perico Id., Panama, Oct. 26, 1904; 1 ♂.

[1] Bull. Lab. Nat. Hist. State Univ. Iowa, 1898, **4**, 274.

Actaea dovii Stimpson.

Actea dovii Stimpson, Ann. Lyc. Nat. Hist. N. Y., 1871, **10**, 104.

Perico Id., Panama; Oct. 26, 1904; 2 ♀.

Ozius verreauxii Saussure.

Ozius verreauxii Saussure, Rev. Mag. Zool., 1853, (2), **5**, 359, pl. 12, fig. **1**. A. Milne Edwards, Miss. Sci. au Mexique, Zool., 1880, part 5, **1**, 277, pl. 55, fig. 4.

Taboguilla Id.; between tide marks; Oct. 31, 1904; 1 ♀.

Ozius agassizii A. Milne Edwards.

Ozius agassizii A. Milne Edwards, Miss. Sci. au Mexique, Zool., 1880, part 5, **1**, p 279, pl. 55, fig. **1**.

Taboguilla Island; between tide marks; Oct. 31, 1899; 4 ♂, 6 ♀, 10 juv.
Perico Id., Panama; Oct. 26, 1904; 1 ♂, 1 juv.

Heteractaea lunata (Milne Edwards and Lucas).

Heteractaea lunata A. Milne Edwards, Miss. Sci. au Mexique, Zool., 1880, part 5, **1**, 301, pl. 52, fig. 2.

Taboguilla Id.; between tide-marks; Oct. 31, 1899; 1 ♂, 1 ♀.
Taboguilla Id.; from coral, 1 fath., low tide; Oct. 31, 1904; 4 ♂, 2 ♀, 1 juv.

Eriphia squamata Stimpson.

Eriphia squamata Stimpson, Ann. Lyc. Nat. Hist. N. Y., 1859, **7**, 56; 1860, **7**, 217.

Taboguilla Id.; between tide-marks; Oct. 31, 1899; 2 ♀.

PORTUNIDAE.

Portunus (Achelous) affinis (Faxon).

Achelous affinis Faxon, Bull. Mus. Comp. Zoöl., 1893, **24**, 155; Mem. Mus. Comp. Zoöl., 1895, **18**, 23, pl. 4, figs. 1, 1 *a*, 1 *b*.

Off Acapulco, lat. 17° 20′ N., long. 101° 32′ W., surface, from turtle, station 4594, Oct. 14, 1904; 11 specimens apparently half digested.

Euphylax dovii Stimpson.

Euphylax dovii Stimpson, Ann. Lyc. Nat. Hist. N. Y., 1860, **7**, 226, pl. 5, fig. 5.
Euphylax dovii A. Milne Edwards, Miss. Sci. au Mexique, 1879, 204, pl. 38, fig. 2.

Off Gulf of Panama, lat. 7° 15′ N., long. 82° 8′ W., surface, station 4619, Oct. 20. 1904; 1 ♀.

INACHIDAE.

Acanthonyx petiverii Milne Edwards.

Acanthonyx petiverii Milne Edwards, Hist. Nat. Crust., 1834, **1**, 343.
Acanthonyx Petiveri A. Milne Edwards, Miss. Sci. au Mexique, Zool., 1878, part 5, **1**, 143, pl. 27, fig. 7, and synonymy.

Perico Id., Panama; Oct. 26, 1904; 1 ♂.

Pelia pacifica A. Milne Edwards.

Pelia pacifica A. Milne Edwards, Miss. Sci. au Mexique, Zool., 1875, **1**, part 5, 73, pl. 16, fig. 3. Not **Pelia pacifica** Rathbun, Proc. U. S. Nat. Mus., 1893, **16**, 90.

Perico Id., Panama; Oct. 26, 1904; 1 ♂, 2 ♀.

An examination of the specimens from the same locality as the type (Bay of Panama) leads me to believe that the specimens that I have hitherto assigned to *P. pacifica* are a distinct species. The specimens from Perico Island are very short and broad (♂, length 8.5, width 6.4 mm.) and have very short horns, and in the ♂ the palms much enlarged and fingers gaping at base.

The other form, which extends from Santa Catalina Id., Cal., probably to Magdalena Bay, L. Cal., is longer and narrower (♂, Southern Calif. length 13.4 mm., width 8.5 mm.), the horns longer, and the palms of the ♂ only slightly enlarged, tapering distally, fingers not gaping. I venture to give a new name to this form — *P. clausa* — the type being a ♂ from a lot collected in Southern California by Dr. W. H. Dall (Cat. No. 16203, U. S. N. M.)

One specimen, a ♂, from off Magdalena Bay, L. C., station 2989, "Albatross," which in 1893 (*loc. cit.*) I called *Pelia*, sp., is very puzzling. It has the claws of typical *pacifica*, but the carapace is not so wide; but this may be due to its greater size (8.6 mm. wide by 12.6 mm. long). On the whole I think that it may be referred to the true *pacifica*, but more material is necessary to determine this point.

Scyramathia cornuta (Rathbun).

Anamathia cornuta Rathbun, Proc. U. S. Nat. Mus., 1898, **21**, 571, pl. 41, fig. 2.

Ten miles from Hood Id., Galapagos; 633 fath., station 4641; Nov. 7, 1904; 1 ♂.

Scyramathia vesicularis, sp. nov.

Pl. 5, Fig. 7; Pl. 8, Figs. 1, 1*a*.

Body and legs everywhere covered with a pubescence formed of spherical vesicles; a few long, slender hairs on the gastric region, the lateral margins, and the rostrum. Carapace armed with eighteen short, stout, and pointed spines, of which four are on the gastric region, one is on the cardiac, one on the intestinal region, four on each branchial region, one on each hepatic region, and one above each eye; in addition, the post-ocular lobe is narrow, curved, and acute.

Rostrum composed of two slender divergent horns $\frac{2}{5}$ the length of the rest of the carapace.

Eyes visible even when retracted against the post-ocular lobe.

The narrow basal antennal joint has an antero-external spine, and two spines further back on the outer margin; flagella situated outside the rostrum.

Ischium and merus of outer maxillipeds with a concave surface.

Chelipeds (of ♂) just as long as the carapace and rostrum and little stouter than the other legs; arm with four short spines above, which increase distally; wrist with three or four similar spines; palm with sides parallel, $1\frac{1}{2}$ × as long as the fingers, which meet when closed.

Merus of all the ambulatory legs with a spine or tooth at the distal end. 1st pair $1\frac{1}{2}$ × as long as carapace and rostrum.

In the ♀ the rostrum is shorter, $\frac{1}{3}$ length of remainder of carapace; the cheliped = length of carapace and half the rostrum; the fingers are relatively longer than in the ♂; 1st pair of ambulatories $1\frac{1}{5}$ × as long as carapace and rostrum.

Dimensions. — ♂ type, length 20.7 mm., width 11.5 mm., rostrum 6 mm.

Type locality. — S. E. of Hood Id., Galapagos, 300 fath., station 4642; Nov. 7, 1904; 1 ♂ (type) 3 ♀ (2 gravid) Cat. No. 32,860, U. S. N. M.

This species in its numerous spines resembles *S. pulchra* (Miers),[1] from the Philippines and Andaman Sea, 130 to 561 fathoms, but differs from it in the arrangement of the spines and the shorter legs.

[1] "Challenger" Brachyura, 1886, **17**, 26, pl. 4, fig. 1.

Mithrax bellii Gerstaecker.

Mithrax ursus Bell, Proc. Zool. Soc. London, 1835, **3**, 171, pub. Feb. 24, 1836; Trans. Zool. Soc. London, 1836, **2**, 52, pl. 10, figs. 2 and 3. A. Milne Edwards, Miss. Sci. au Mexique, 1875, part 5, **1**, 103. Not **Cancer ursus** Herbst.
Mithrax bellii Gerstaecker, Arch. f. Natur., 1856, **22**, part 1, 112.
Mithrax bellii Rathbun, Proc. Wash. Acad. Sci., 1902, **4**, 284.

Chatham Id., Galapagos; shore; Jan. 8, 1905; 1 ♀ juv.

The young of this species, as Bell has shown, presents such a different aspect from the adult that it might easily be mistaken for another species. Length of young ♀, Chatham Id., 21.7, width 20.7 mm. The body and legs, except the chelae, are everywhere covered with a furry hair. The protuberances are all sharp-pointed. The rostral horns curve toward each other; the pair of spines at the base of the horns are nearly as long as the horns and diverge from each other; the next pair is very small. In the adult (♂ from Black Bight) the carapace is wider than long (63.6 mm. long × 65.4 mm. wide), the surface is almost wholly naked, and the protuberances are very stout, blunt tubercles.

Mithrax denticulatus Bell.

Mithrax denticulatus Bell, Trans. Zool. Soc. London, 1836, **2**, 54, pl. 11, fig. 2.

Perico Id., Panama; Oct. 26, 1904; 1 ♂, 2 ♀.

Thoe erosa Bell.

Thoe erosa Bell, Proc. Zool. Soc. London, 1835, **3**, 171, pub. Feb. 24, 1836; Trans. Zool. Soc. London, 1836, **2**, 48, pl. 9, fig. 4. A. Milne Edwards, Miss. Sci. au Mexique, 1875, part 5, **1**, pl. 19, fig. 4; 1878, p. 121.

Taboguilla Id.; between tide-marks; Oct, 31, 1899; 1 ♂.
Perico Id., Panama; Oct. 26, 1904; 1 ♂.

CALAPPIDAE.

Calappa convexa Saussure.

Calappa convexa Saussure, Rev. Mag. Zool., 1853, (2), **5**, 362, pl. 13, fig. 3.

Taboguilla Id.; shore; Oct. 28, 1904; 1 ♂.

EXPLANATION OF PLATES.

PLATE 1.

PLATE 1.

Fig. 1. *Pilodius paumotensis*, ♂, type, × 2½.
Fig. 2. *Actaea cavipes*, ♂, Borabora, × 2½.
Fig. 3. *Chlorodopsis scabricula*, ♀, Papeete, × 4.
Fig. 4. *Caphyra rotundifrons*, ♀, Papeete, × 2½.
Fig. 5. *Chlorodopsis venusta*, ♂, type, × 2½.
Fig. 6. *Platypodia digitalis*, ♀, type, × 2½.
Fig. 7. *Cymo quadrilobatus*, ♀, Funafuti, × 1½.
Fig. 8. *Micropanope taboguillensis*, ♂, type, × 2½.
Fig. 9. *Actaea remota*, ♂, type, × 4.
Fig. 10. *Cyclodius gracilis*, ♀, Funafuti, × 4.
Fig. 11. *Leptodius efferens*, ♂, type, × 4.
Fig. 12. *Actumnus integerrimus*, ♀, Fakarava, × 4.

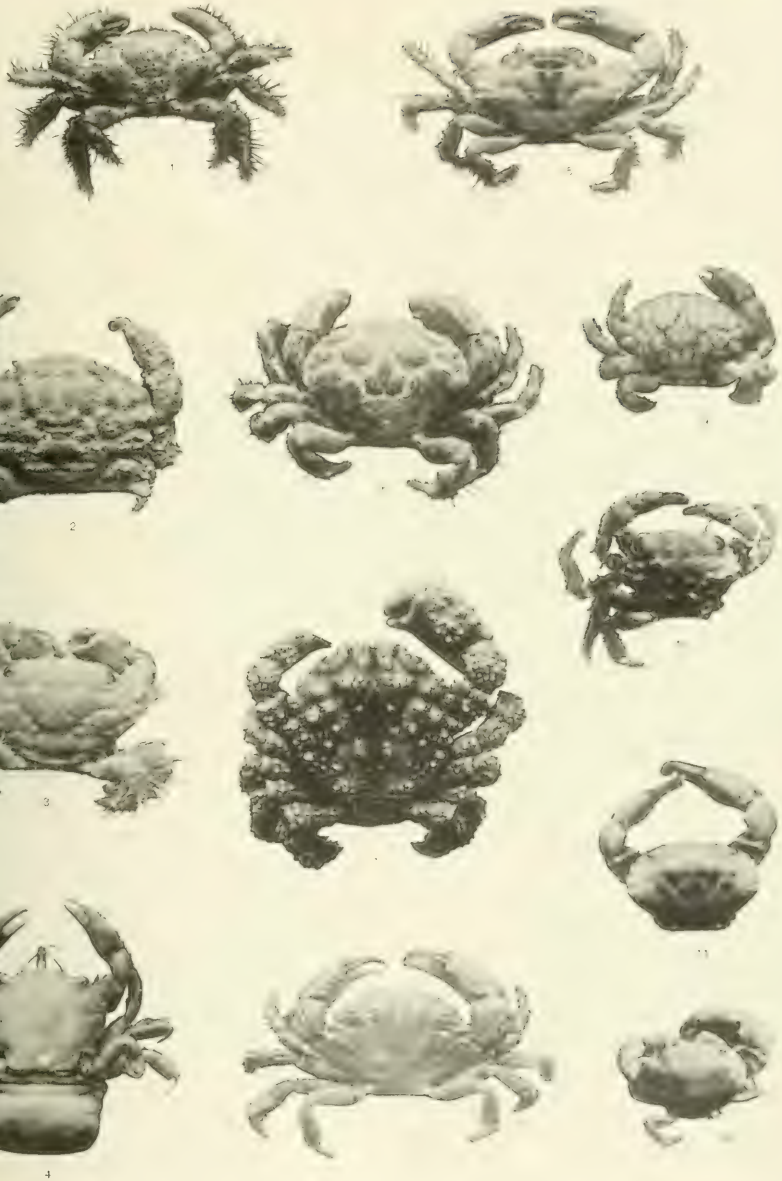
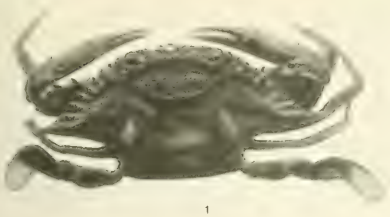


PLATE 2.

PLATE 2.

Fig. 1. *Callinectes alexandri*, ♀, type, × 1½.
Fig. 2. *Hemigrapsus elongatus*, ♂, Tongatabu, × 2½.
Fig. 3. *Ozius tricarinatus*, ♀, type, nat. size.
Fig. 4. *Ptychognathus easterana*, ♂, type, × 2½.
Fig. 5. *Chlorodopsis spinipes*, ♂, Borabora, × 2½.



1

2

3

4

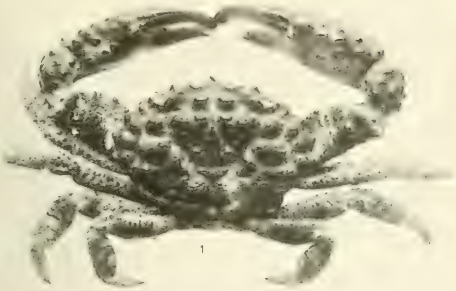
5

HELIOTYPE CO., BOSTON

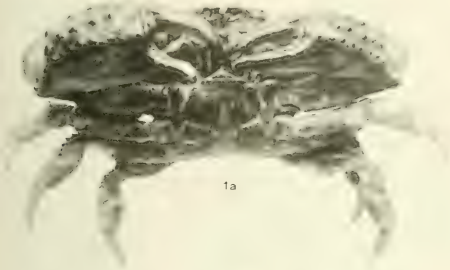
PLATE 3.

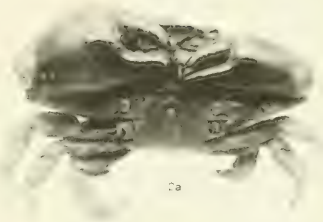
PLATE 3.

Fig. 1. *Phymodius ungulatus*, ♂, Borabora, × 1½.
Fig. 1*a*. Same, under side.
Fig. 2. *Phymodius ungulatus*, ♂, Tongatabu, × 1½.
Fig. 2*a*. Same, under side.
Fig. 3. *Phymodius ungulatus*, ♂, Bonin Islands, × 1½
Fig. 3*a*. Same, under side.
Fig. 4. *Phymodius ungulatus*, ♂, Honolulu, × 1½.
Fig. 4*a*. Same, under side.

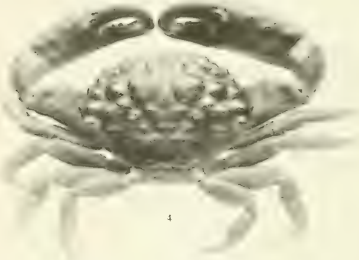

1

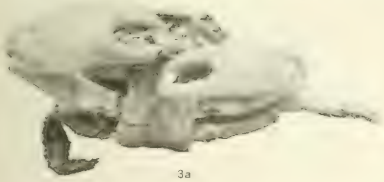
2


1a


2a

3


4


3a

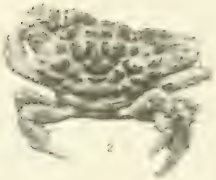
4a

PLATE 4.

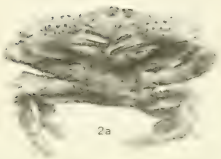
Plate 4.

Fig. 1. *Phymodius ungulatus*, ♂, Fakarava, × 1½.
Fig. 1*a*. Same, under side.
Fig. 2. *Phymodius ungulatus*, ♀, Borabora, × 1½.
Fig. 2*a*. Same, under side.
Fig. 3. *Phymodius ungulatus*, ♂, Fakarava, × 1½.
Fig. 3*a*. Same, under side.
Fig. 4. *Phymodius ungulatus*, ♂, Tari-Tari, × 1½.
Fig. 4*a*. Same, under side.

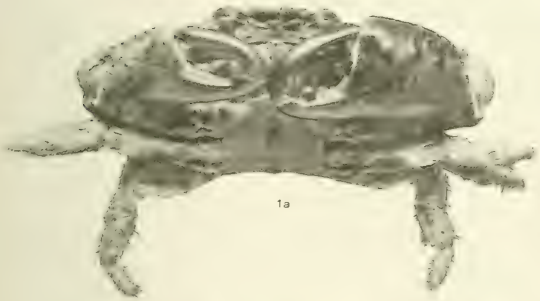
1



2

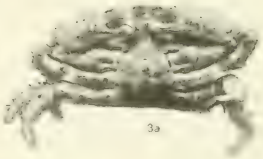


2a



1a

3



3a

4

4a

HELIOTYPE CO., BOSTON.

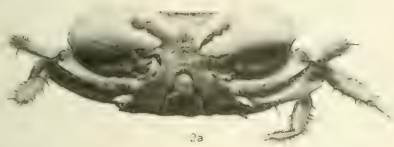
Plate 5.

Plate 5.

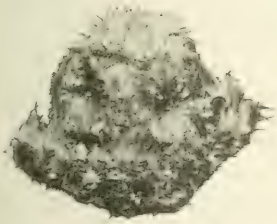
Fig. 1. *Pachygrapsus fakaravensis*, ♂, type, nat. size.
Fig. 2. *Sesarma* (*Parasesarma*) *carolinensis*, ♂, type, × 2½.
Fig. 2*a*. Same, under side.
Fig. 3. *Lophomicippa limbata*, ♀, type, × 4. (Some legs broken off.)
Fig. 4. *Nucia gelida*, ♀, type, × 4.
Fig. 5. *Cyclodius ornatus*, ♀, Fakarava, × 4.
Fig. 6. *Parthenope* (*Parthenope*) *melana*, ♀, type, nat. size.
Fig. 7. *Scyramathia vesicularis*, ♂, type, × 1½.
Fig. 8. *Cycloxanthops cavatus*, ♂, type, × 4. (Hind part foreshortened.)
Fig. 9. *Thalamonyx parvidens*, ♂, type, × 1½.

1

2



2a



3

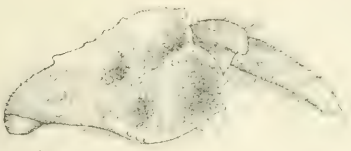
4

5

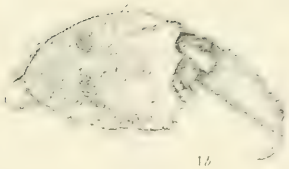
PLATE 6.

Plate 6.

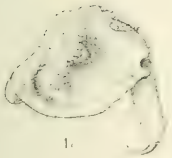
Fig. 1. *Lophomicippa limbata*, ♀, type, side view, ×4.
Fig. 1*a*. First leg of same, ×8.
Fig. 1*b*. Second leg of same, ×8.
Fig. 1*c*. Third leg of same, ×8.
Fig. 1*d*. Fourth leg of same, ×8.
Fig. 1*e*. Maxilliped of same, ×16.
Fig. 1*f*. Front of same, ×8.
Fig. 1*g*. Cheliped of same, ×12.
Fig. 2. *Parthenope* (*Parthenope*) *melana*, ♀, type, ×1½.
Fig. 3. *Cycloxanthops cavatus*, ♂, type, maxilliped, ×24.
Fig. 3*a*. Same, cheliped, ×8.



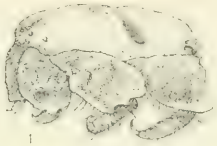
1a



1b



1c



1

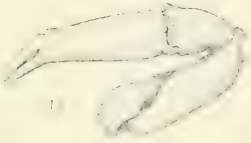
1d

1e

2

2

1f



1

3a

HELIOTYPE CO., BOSTON

PLATE 7.

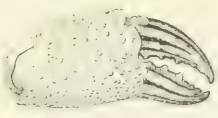
Plate 7.

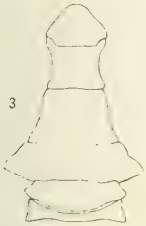
Fig. 1. *Actaea remota*, ♂, ×3⅜.
Fig. 2. *Hemigrapsus elongatus*, ♂, Tongatabu, maxilliped, ×11.
Fig. 2*a*. Abdomen of same, ×7.
Fig. 3. *Micropanope taboguillensis*, ♂, type, abdomen, ×8.
Fig. 3*a*. Larger chela of same, ×4.
Fig. 4. *Ptychognathus easterana*, ♂, type, maxilliped, ×8.
Fig. 4*a*. Abdomen of same, ×4⅘.
Fig. 5. *Xanthias ponapensis*, ♂, type, ×3½.
Fig. 5*a*. Abdomen of same, ×8.
Fig. 6. *Leptodius efferens*, ♂, type, larger chela, ×7⅛.
Fig. 6*a*. Abdomen of same, ×16.
Fig. 7. *Cyclodius gracilis*, ♀, Funafuti, front, ×4.
Fig. 8. *Cyclodius ornatus*, ♀, Tari-Tari, front, ×7⅛.

2

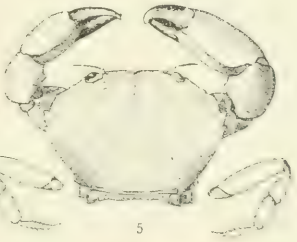
1

2a


3a


3

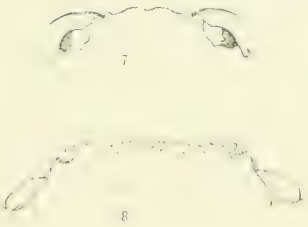
4


5

6

4a

5a


7 8

6a

HELIOTYPE CO., BOSTON.

PLATE 8.

Plate 8.

Fig. 1. *Scyramathia vesicularis*, ♂, type, × 2⅔.
Fig. 1*a*. Ventral view of anterior half of same, × 4.
Fig. 2. *Pilodius paumotensis*, ♂, type, × 3½.
Fig. 2*a*. Chela of same, × 5⅔.
Fig. 2*b*. Abdomen of same, × 9.
Fig. 3. *Actumnus integerrimus*, ♀, Fakarava, carapace, × 8.
Fig. 3*a*. Cheliped of same, × 8.
Fig. 3*b*. Longest leg of same, × 9⅔.

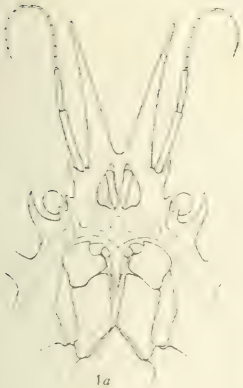
3

2 c

3 c

3 b

2



1 a

2 b

1

HELIOTYPE CO. BOSTON

PLATE 9.

Plate 9.

Fig. 1. *Sesarma* (*Parasesarma*) *carolinensis*, ♂, type, upper surface of movable finger, $\times 6\frac{2}{3}$.

Fig. 2. *Nucia gelida*, ♀, type, carapace, $\times 8$.

Fig. 2*a*. Second leg of same, $\times 16\frac{4}{5}$.

Fig. 2*b*. Cheliped of same, $\times 13\frac{2}{3}$.

Fig. 2*c*. Front view of same, $\times 19$.

Fig. 3. *Callinectes alexandri*, ♂, Papeete, lateral teeth, $\times 4\frac{4}{5}$.

Fig. 3*a*. Abdomen of same, $\times 4$.

Fig. 3*b*. Front of same, $\times 4\frac{4}{5}$.

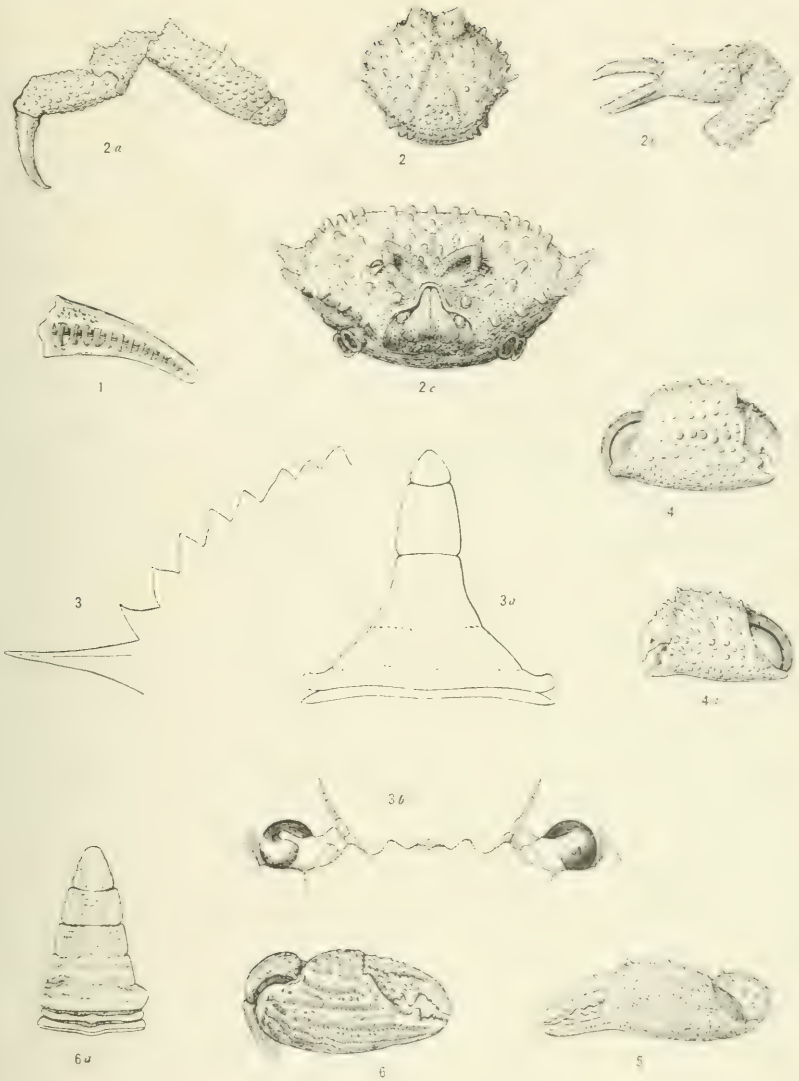
Fig. 4. *Platypodia digitalis*, ♀, type, right chela, $\times 4$.

Fig. 4*a*. Left chela of same, $\times 4$.

Fig. 5. *Chlorodopsis scabricula*, ♀, Papeete, chela, $\times 6\frac{2}{3}$.

Fig. 6. *Pachygrapsus fakaravensis*, ♂, type, chela, $\times 2\frac{2}{3}$.

Fig. 6*a*. Abdomen of same, $\times 2\frac{2}{3}$.


2a
2
2b
1
2c
4
3
3a
4a
3b
6a
6
5

Memoirs of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. XXXV. No. 3.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, to MARCH, 1905, LIEUT. COMMANDER L. M. GARRETT, U. S. N., COMMANDING.

XXV.

THE SHORE FISHES.

By WILLIAM C. KENDALL and LEWIS RADCLIFFE.

WITH EIGHT PLATES.

[Published by permission of George M. Bowers, U. S. Commissioner of Fish and Fisheries.]

CAMBRIDGE, U. S. A.:
Printed for the Museum.
April, 1912.

THE SHORE FISHES.

INTRODUCTION.

The fishes which form the basis for the present report were collected from the following localities: — Acapulco, Mexico; Perico, Naos, and Toboguilla islands in Panama Bay; the shores and markets of Panama City; the Galapagos Islands (principally at Wreck Bay, Chatham Island); in Cook and La Perouse bays and along shores of Easter Island; Manga Reva (principally in Port Rikitea and on the outer reef); and from dredge hauls taken along the coast of southern California, Mexico, Central America, Peru, and the open seas *en route* to the above mentioned island groups which yielded a few pelagic forms.

As would be expected from places so widely separated the faunas are more or less distinct. An examination of the list of species as represented by the collection reveals the following points: —

1. The fauna of the Galapagos is quite similar to that of Mexico and Central America.

2. The fauna of Easter Island (represented by twenty-two species not taken at any other point visited) seems to be different from that of its nearest neighbor, Manga Reva (Paumotus) and appears closest to that of Norfolk Island.

3. With one exception (*Mapo soporator*) none of the forty-two species from Manga Reva was taken at any other point visited. Its fauna is naturally similar to that of the other islands of the Paumotu Archipelago.

Unless otherwise stated, proportional measurements of length of head and depth of body are expressed in terms of length without the caudal, and the others in terms of length of head measured from tip of snout to posterior edge of opercle. In the scale counts in longitudinal series, the total number of transverse rows above the lateral line has been counted and only the fully developed scales at the base of the caudal included.

In this collection there are representatives of fifty-five families and two hundred and twenty-seven species, of which the following are described as new:—*Raja aguja*, *Kuhlia nutabunda*, *Girella nebulosa*, *Eques fuscovittatus*, *Gillelus rubellulus*, and *Enneapterygius corallicola*.

The description of a new blenny, *Alticus margaritatus* from Pago Pago, Samoa is also included in the present report.

Specimens representing one hundred and fifty species have been sent to the Museum of Comparative Zoölogy, all others including the types of the new species, to the U. S. National Museum.

The illustrations are from drawings by Miss Violet Dandridge.

RAJIDAE.

Raja aguja, sp. nov.

Plate 1, figs. 1–2.

Type, No. 65641, U. S. N. M. (field No. 3161), a female $18\frac{7}{8}$ inches long from Station 4653, near Aguja Point, Peru.

Cotype, No. 1364, M. C. Z. (field No. 3162), a male $11\frac{1}{2}$ inches long, from same place.

The greatest width of disc in its posterior half; angle of snout obtuse; front margin of pectoral sinuous, convex opposite eye, concave posteriorly; pectoral rounded posteriorly; ventral deeply notched; caudal fin small, distinct; a narrow keel on posterior part of tail, becoming a mere ridge anteriorly; anterior margin of spiracles, nasal and gill flaps fringed; a wide-set row of small concealed spines on the median dorsal line; thirty-three low sharp spines along median dorsal line of tail, beginning somewhat in advance of base of pectoral and extending to first dorsal; a single spine between first and second dorsal; basal half of pectoral without spinules, a very few scattered ones on posterior outer half; an elongate wide-set patch along the anterior margin of pectoral; a few on snout, these more numerous between the eyes; a few on shoulder; tip of snout prickly; dorsal surface of tail with numerous sharp spinules; anterior margin of pectoral, snout, and ventral surface thickly covered with minute prickles; snout as far back as nostrils, around nostrils, and corner of mouth posteriorly for a short distance, with less numerous finer prickles; region between upper jaw and nostrils without prickles; a few minute prickles along base of pectoral; a few on posterior part of breast; a small patch on posterior margin of each gill-slit; none on sides of abdomen except anteriorly at the sides; no

prickles or spines on ventral portion of tail; posteriorly a broad patch of prickles along middle of pectoral.

Color in alcohol: — dorsal surface purplish brown; a large gray spot at posterior base of pectoral; smaller and fainter spots scattered over dorsal surface, also a row around margin of pectoral; ventral surface slaty; mouth, nasal flaps, and gill-flaps pale.

In the cotype the anterior border of the disc is nearly straight, in other respects agreeing with the larger specimen. The dorsal surface is covered with prickles, these are thickest on tail, middle line of back, between the eyes, in front of the eyes, and on the anterior margin of pectoral; fewer in the places where there were more in the larger specimen; no prickles on ventral surface of body or tail; a slight fold along ventral margins of tail.

Color in alcohol; dorsal surface purplish brown, scarcely any pale spots showing; ventral surface slaty gray; margin of mouth, nasal flaps, gill-flaps, tips of ventrals, and claspers pale.

Measurements of the dorsal surface.

	No. 65641 U. S. N. M.	No. 1364 M. C. Z.
Total length	480 mm.	286 mm.
Tip of snout to posterior base of pectoral	230	137
Width of disc	340	185
Distance from tip of snout to front of eye	67	41
Distance between eyes	20	15
Longitudinal diameter of eyes	16	13
Length of spiracle	15	8
Height of first dorsal	19	10
Base of dorsal	16	7
Height of second dorsal	15	10
Base of second dorsal	15	8
Distance between first and second dorsal	9	5
Posterior end of second dorsal to tip of caudal	16	15
Distance between posterior bases of pectoral	46	24
Spines along median dorsal line of tail	33	24
Spines between first and second dorsal	1	1

Measurements of the ventral surface.

	No. 65641 U. S. N. M.	No. 1364 M. C. Z.
Distance from tip of snout to vent	240 mm.	136 mm.
Distance from posterior part of vent to tip of caudal	232	144
Length of anterior lobe on anterior margin of ventral	52	34
Distance between anterior base of lobes of ventral	47	31
Distance from tip of snout to central margin of upper jaw	70	45
Width of mouth	41	23
Rows of teeth in upper jaw	30	30
Rows of teeth in lower jaw	28	28

DASYATIDAE.

Urolophus halleri Cooper.

Proc. Cal. Acad. Sci., 1863, **3**, p. 95. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 80.

A single example, a male, No. 3335, 12 inches long from Acapulco.

Snout $\frac{1}{5}$ disc; spinous portion of tail longer than snout to ventrals; about eighteen retrorse barbs, these more widely separated than in *U. aspidurus*; eyes about as large as spiracles; caudal blunt and rounded.

Urolophus aspidurus Jordan & Gilbert.

Bull. U. S. Fish Comm., 1881, **1**, p. 307. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 81.

One specimen, No. 3137, $11\frac{1}{4}$ inches long from Bay of Panama.

Urolophus rogersi Jordan & Starks.

Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 388.

A single individual, No. 3376, $11\frac{1}{4}$ inches long from Acapulco. Distance from tip of snout to a line across back from posterior base of pectorals 1.22 in width of disc; tail, measured from vent 1.17 in width of disc; distance from vent to anterior insertion of caudal spine 2.5 in width of disc; distance from anterior insertion of caudal spine 2.30 in width of disc; length of spine 1.33 in distance from posterior edge of eye to tip of snout; twelve retrorse barbs on side of caudal spine; caudal rounded; tubercles with a stellate base; five enlarged tubercles on median line of back in humeral region; three smaller ones near the base of tail; scattered small prickles on the interorbital space, along side of back, posterior margin of pectorals, tip of snout, becoming numerous on the tail; upper lip fimbriated.

CLUPEIDAE.

Sardinella thrissina (Jordan & Gilbert).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 430.
Clupea thrissina Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, **5**, p. 353.

Twelve specimens, $1\frac{13}{16}$ to $2\frac{5}{8}$ inches long from Acapulco. M. C. Z. 29430 (3 specimens).

Four specimens $1\frac{3}{8}$ to $1\frac{7}{8}$ inches long from Toboguilla Island, October 28, 1904.

In these individuals the edges of the scales are crenate, scales 17+12 or 13; dorsal II, 15; anal II, 14 or 15.

Opisthopterus dovii (GÜNTHER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 437.
Pristigaster dovii GÜNTHER, Cat., 1868, **7**, p. 461.

Two specimens $8\frac{1}{8}$ to $8\frac{5}{8}$ inches long from Panama Bay. M. C. Z. 29708 (1 specimen).

ENGRAULIDAE.

Anchovia opercularis (JORDAN & GILBERT).

GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 42.
Stolephorus opercularis JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1881, **4**, p. 275.

Several specimens $\frac{3}{4}$ to $1\frac{5}{8}$ inches long from Station No. 1, beach, Panama, with other fishes in the stomach of a Lutianus. M. C. Z. 29585 (4 specimens).

These specimens are in bad condition but those that can be made out at all are pretty certainly this species. One specimen shows nineteen anal rays, dorsal cannot be counted. Another had fourteen dorsal and nineteen anal rays; maxillary just reaching the joint of mandible; scales entirely wanting and only the faintest indication of a narrow silvery lateral stripe.

Anchovia macrolepidota (KNER & STEINDACHNER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 449.
Engraulis macrolepidota KNER & STEINDACHNER, Abhandl. Bayer. Akad. Wiss., 1864, **10**, p. 21, pl. 3, fig. 2.

One specimen 7 inches long from Panama Bay.

Anchovia ischana (JORDAN & GILBERT).

GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 42.
Stolephorus ischanus JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, **4**, p. 340.

Twenty-five specimens $1\frac{1}{4}$ to $2\frac{1}{16}$ inches long from Acapulco, March 2, 1905. M. C. Z. 29437 (10 specimens).

OPHICHTHYIDAE.

Quassiremus evionthas (JORDAN & BOLLMAN).

JORDAN & DAVIS, Rept. U. S. Fish. Comm. for 1888, 1892, p. 623, pl. 77.
Ophichthus evionthas JORDAN & BOLLMAN, Proc. U. S. Nat. Mus., 1890, **12**, p. 154.

One example, No. 3255, $19\frac{1}{2}$ inches long from Wreck Bay, Chatham Island.

MURAENIDAE.

Muraena clepsydra GILBERT.

Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2805. (*Muraena melanotis* GÜNTHER in part).

One specimen, No. 3118, 22 inches long from Panama Bay.

Muraena lentiginosa JENYNS.

Zool. Voy. Beagle. Fish, 1842, pt. 4, p. 143.

A single example No. 3374, 17 inches long from Acapulco.

Teeth uniserial in both jaws; one large, fang-like tooth on vomer anteriorly; a single row of small, sharp teeth on palate. Both Bleeker and Günther state that the teeth are biserial or uniserial according to the age of the individual, and that the teeth on the palate are sometimes entirely lost with age.

Anterior and posterior nasal tubes of our specimen are moderate, posterior slightly the longer; eye 2.16 in snout; snout 1.92 in gape.

General color in alcohol:—dark yellowish brown, covered with yellowish spots of various sizes, both body and fins thus colored, largest spots about $\frac{2}{3}$ diameter of eye, all surrounded by a ring of black.

Gymnothorax dovii (GÜNTHER).

SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 348.
Muraena dovii GÜNTHER, Cat., 1870, **8**, p. 103.

Specimens, No. 3170, $25\frac{1}{2}$, 3171, 16, 3200, M. C. Z. 29663, 15, 3201, M. C. Z. 29640, 17 inches long from Cook Bay, Easter Island.

Teeth in No. 3170 are in a single series on sides of both jaws; same on vomer; in front of this row on vomer is a single long fang-like tooth, there being quite a space between the tooth and the end of the row; eye 2.5 in snout; snout 2 in gape.

General color dark brown; the entire specimen thickly covered with small yellow spots interspersed with larger black ones, giving it a speckled appearance; anal with a narrow margin of yellow; dorsal margin yellow only where the spots touch the margin.

In No. 3171 the teeth are biserial on the sides of upper jaw, and uniserial in lower jaw; anteriorly in the upper jaw there are two transverse rows of three fang-like teeth each; eye 1.83 in snout; snout 2.36 in gape.

General color similar to above, except posteriorly. The spots on body and fins are somewhat larger; no distinct pale margins to the fins; on the belly the yellow spots are finer and more or less coalescent, giving a rivulated appearance.

In 3200, M. C. Z. 29663, the teeth are similar to those in No. 3171; eye 2 in snout; snout 2.22 in gape.

Coloration similar to No. 3171, except that the spots are distinct on the belly and do not give the rivulated appearances; on the fins, the spots are a

little more regularly rounded; the larger of the black spots are a little more than half the size of eye.

In No. 3201, M. C. Z. 29640, the teeth are exactly as in the last specimen; eye 2.09 in snout; snout 2.17 in gape.

General color, dark chocolate brown, thickly covered with small pale spots anteriorly, and sparsely posteriorly; numerous black spots, many as large as eye on body, arranged in more or less regular transverse rows at least anteriorly.

Uropterygius necturus (JORDAN & GILBERT).

JORDAN & EVERMANN, Bull. **47**, U. S. Nat. Mus., 1906, pt. 1, p. 404.
Gymnomuraena necturus JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, **5**, p. 356.

A specimen, No. 3377, 16 inches long from Acapulco.

Descriptions of this species state that it has no posterior nasal rim or tube. The specimen studied, however, has a prominent posterior nasal tube. All the specimens entering into these descriptions were small and the length of the tube in specimens of Uropterygius and "Scuticaria" seem to vary with the size or age of the individual. The present specimen is in poor condition, is strongly compressed laterally, fins showing only on the end of tail and confluent around it, the dorsal extending about twice as far forward as the anal; eye 2.28 in the snout; snout 2.62 in gape; teeth in two series on the sides of upper jaw meeting at the symphysis, the outermost numerous and much smaller, inner long and sharp; behind the inner row of teeth in front are two cross-rows of four each, very long sharp teeth; mandible with two rows of teeth similar to those in upper jaw, but the long sharp teeth are bunched and not in rows.

Color in alcohol: — uniform dark purplish brown, no traces of markings anywhere observable; the vertical fins yellowish.

SILURIDAE.

Sciadeichthys troscheli (GILL).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 122.
Sciades troscheli GILL, Proc. Acad. Nat. Sci. Phil., 1863, p. 171.

One individual, No. 3142, $13\frac{1}{4}$ inches long from Panama anchorage.

POECILIIDAE.

Poecilia sphenops CUVIER & VALENCIENNES.

Hist. Nat. Poiss., 1846, **18**, p. 98 (130). Regan, Biol. Centr. Amer. Pisces, 1907, p. 102, pl. 13, fig. 1–7.

Twenty-five specimens $\frac{3}{4}$ to $1\frac{7}{8}$ inches long from one mile south of Panama City, October 23, 1904. M. C. Z. 29433 (10 specimens).

BELONIDAE.

Tylosurus stolzmanni (Steindachner).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 713.
Belone stolzmanni Steindachner, Sitzb. Ak. Wiss. Wien, 1878, **7**, p. 397; (Beiträge, 7, p. 21).

One specimen, No. 3254, 26 inches long from Wreck Bay, Chatham Island.

SCOMBRESOCIDAE.

Scombresox sp.

One specimen $1\frac{9}{16}$ inches long from Station 4709. Open sea between Galapagos Islands and Easter Island.

Three specimens 2 to $2\frac{1}{4}$ inches long from Station 4669, off Callao, Peru.

Three specimens (dried) $\frac{1}{2}$ to $\frac{3}{4}$ inches long from Station 4657, off coast of Peru. M. C. Z. 29610 (1 specimen).

One specimen $2\frac{1}{8}$ inches long from Station 4665, off Peru.

Eight specimens $\frac{9}{16}$ to $1\frac{1}{4}$ inches long from Station 4571, Lat. 33°, 40′ N.; Long. 119°, 35′ W.

Twelve specimens $\frac{13}{32}$ to $\frac{13}{16}$ inch long from Station 4651, Lat. 5°, 41.7′ S.; Long. 82°, 59.7′ W.

Eight specimens $1\frac{3}{4}$ to $2\frac{1}{4}$ inches long from Station 4667, Lat. 11°, 59.5′ S.; Long. 83°, 40.4′ W.

Three specimens $1\frac{7}{8}$ to $2\frac{1}{2}$ inches long from Station 4673, Lat. 12°, 30.5′ S.; Long. 77°, 49.4′ W.

We have compared these specimens with somewhat larger specimens of the young in the U. S. National Museum of *Scombresox saurus* and *S.* (*Cololabis*) *brevirostris*. Our examples are too small for certain identification with either.

HEMIRAMPHIDAE.

Hyporhamphus unifasciatus (Ranzani).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 720.
Hemiramphus unifasciatus Ranz., Nov. Comm. Ac. Sci. Inst. Bonon., 1842, **5**, p. 326.

Five specimens $5\frac{5}{8}$ to $6\frac{5}{16}$ inches long from Acapulco, February 28, 1905, M. C. Z. 29436 (2 specimens).

Hyporhamphus roberti (Cuvier & Valenciennes).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 721.
Hemiramphus roberti Cuv. & Val., Hist. Nat. Poiss., 1846, **19**, p. 18 (24).

One specimen, No. 3349, $7\frac{1}{4}$ inches long from Acapulco.

Hemiramphus saltator Gilbert & Starks.

Mem. Cal. Acad. Sci., 1904, **4**, p. 53, pl. 9, fig. 16.

Two specimens $2\frac{1}{4}$ and 3 inches long from Station 4596, off Acapulco, M. C. Z. 29591 (1 specimen).

These are provisionally placed here as they agree very well in most respects. In spirits the color of the beak is black; a broad dark brown band running from snout through eye to base of caudal, above which the body is lighter brown; sides of head from and below eye across the opercle and side of belly abruptly silvery; two dusky stripes along belly beginning faintly at throat, increasing in intensity to ventral fin and terminating near front of anal where they merge into the dusky color of that part of body; pectoral pale, dorsal dusky posteriorly; ventrals pale with large black area covering nearly entire base of fin and narrowing as it continues on inner edge to last third of fin.

EXOCOETIDAE.

Exocoetus volitans Linné.

Syst. Nat., ed. 10, 1758, p. 316. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 351.

One specimen $2\frac{5}{8}$ inches long from Station 4615, Lat. 9°, 7′ N.; Long. 85°, 11′ W.

Dorsal 12; anal 13. Barbel at chin black, nearly as long as head; insertion of ventrals about midway between tip of lower jaw and base of next to last anal ray; ventrals short, not nearly reaching anal; pectorals long, reaching nearly to fork of caudal; upper pectoral ray simple, other rays branched; caudal lobes unequal, lower longer than head; pectoral black, the lower three or four rays pale, tips of others probably white; pectoral with a large black spot near base of inner rays, another one near the end of the fin at the outer end of the same rays; caudal pale with some dusky punctulations on lower half of lower lobe; membranes of dorsal and anal black, especially posteriorly; back brownish; belly silvery; traces of four broad, dark cross-bands on body, most distinct posteriorly, the second of these bands immediately in front of dorsal, the 3rd extending from base of 6th to base of 10th dorsal rays inclusive; 4th on base of caudal peduncle; chin and snout with dusky punctulations.

The following specimens, with the two exceptions noted, differ somewhat from the preceding in color and also in not having a barbel on chin, but they agree in position and length of ventral and in the number of dorsal and anal rays.

One specimen $2\frac{1}{16}$ inches long from Station 4710, Lat. 9°, 30′ S.; Long. 95°, 83′ W.

Back and top of head light brown, thickly punctulated with darker; lower part of head and body silvery; pectoral dusky with a broad pale terminal margin and with a trace of a pale bar extending partly across fin, occupying the second 4th of fin reckoning from its base; trace of dusky transverse bar on body under posterior part of dorsal and extending somewhat on dorsal and anal fins; a dusky area at base of caudal fin.

Another specimen $1\frac{1}{2}$ inches long from Station 4720, Lat. 7°, 13′ S.; Long. 102°, 31.5 W.

Top of head and back to slightly beyond origin of dorsal purplish brown; lower parts pale, somewhat punctulate with darker; dusky area of back just back of pectoral fin extending as a broad faint bar nearly to ventral; a broad dark brown vertical bar on body under posterior part of dorsal extending somewhat on dorsal and on anal fins; in front of this a pale bar of about same width separating it from the body color anteriorly, and behind the dark bar another pale bar separating it from the dark area at base of caudal; ventrals pale; dorsal and anal pale, except from the extension of the dark bar; caudal pale; pectoral pale with a broad black triangular area covering about half of anterior margin of fin, apex of triangle on membrane between 6th and 7th ray; tips of all the rays pale, the membrane between the first and second rays punctulated with dark.

Two specimens, $\frac{7}{8}$ and $1\frac{3}{8}$ inches long, from Station 4718, Lat. 5°, 32.4 S.; Long. 99°, 32.2 W.

These specimens are similar in color to the last, as are also two specimens $\frac{7}{8}$ and 1 inches long from Station 4729, Lat. 7°, 15′ N.; Long. 82°, 8′ W.

Two specimens $1\frac{7}{8}$ and $2\frac{1}{8}$ inches long from Station 4640, Lat. 0°, 39.4 N.; Long. 88°, 11′ W. The smaller specimen has a long black barbel; ventral nearly all black. The larger has a long barbel, dusky with black tips; ventral like that in specimens from Station 4615.

Cypsilurus poecilopterus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 210, fig. 14.
Exocoetus poecilopterus Cuv. & Val., Hist. Nat. Poiss., 1846, **19**, p. 81 (112). Günther, Fische der Südsee, 1909, **8**, p. 368.

One specimen $\frac{15}{16}$ of an inch long from Station 4686, Lat. 18°, 47.1′ S.; Long. 89°, 26′ W.

Anal 12; dorsal 13 or 14 (broken and count uncertain). Cuvier and

Valenciennes state that the dorsal is 12 and anal 8, but in their figure at least 13 rays are shown in the anal. Bleeker (Atlas) states that the dorsal is 12 or 13 and anal 9, but his figure shows 12 or 13 in the anal.

General color pale, slightly brownish on back; body thickly sprinkled with black dots; pectoral black, dotted; ventral blackish; caudal pale; anal and dorsal broken, but showing indications of black color.

Cypsilurus sp.

One specimen $3\frac{1}{16}$ inches long from Station 4619, surface, Lat. 7°, 15′ N.; Long. 82°, 8′ W.

Length to base of caudal 63 mm.; head 4.5; depth 4.84; eye 2.33; snout very short; mouth small, very oblique; interorbital 2.33; dorsal $10\frac{1}{2}$; anal 8; pectoral reaches to below 9th dorsal ray; ventral inserted about midway between posterior margin of eye and base of caudal; insertion of the dorsal somewhat in advance of anal; scales about 45; first four rays of pectoral simple, shorter than others. Sixth pectoral ray longest; lower caudal lobe longest.

Color in spirits brownish above, silvery below; pectoral black with paler rays, base whitish below, tips white; ventral and dorsal black; anal pale; caudal pale with three faint diffuse spots on lower lobe.

Fodiator acutus (Cuvier & Valenciennes).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 728.
Exocoetus acutus Cuv. & Val., Hist. Nat. Poiss., 1846, **19**, p. 91 (125).

One specimen $\frac{3}{4}$ inch long from Acapulco.

Head 3.24 in length; length of beak 2.9 in head; eye 4.33 in head; dorsal 10; anal 11. Beak black; back brown; a blackish stripe with poorly defined edges along the side from behind pectoral; posterior part of body from insertion of ventrals to insertion of dorsal blackish; outer half of pectoral, except 1st ray, black, inner rays pale; ventrals, except 1st ray, black; anal and caudal pale; middle of dorsal black.

? Exonautes sp.

One specimen $1\frac{1}{4}$ inches long from Station 4646, Lat. 4°, 1.6′ S.; Long. 89°, 16.3′ W., surface.

Length to base of caudal 26 mm.; head 4.74 ; depth 6.50; eye 2.06; interorbital 2.20; dorsal 10; anal 11; first 3 pectoral rays simple.

Color in alcohol: — general color plain pale straw; a few black dots on top of head and on jaws; body without spots anterior to origin of ventral, posterior

to this many small black dots extending back as far as last dorsal ray, on the sides to the caudal, and on the ventral surface to the last anal ray; pectoral plain translucent with broad black anterior and lateral margin, posterior margin plain; ventral thickly dotted with black; a large black spot about as large as eye lying on the posterior outer half of fin.

Another specimen $1\frac{1}{4}$ inches long from Station 4619, Lat. 7°, 15′ N.; Long. 82°, 8′ W., had dorsal 10; anal 11.

A third specimen $\frac{3}{4}$ inches long from Station 4741.

In the last two specimens the origin of ventrals is midway between posterior margin of eye and base of lower caudal rays; first three rays of pectoral simple.

ATHERINIDAE.

Kirtlandia gilberti (JORDAN & BOLLMAN).

GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 58.
Menidia gilberti JORDAN & BOLLMAN, Proc. U. S. Nat. Mus., 1890, **12**, p. 155.

Thirty-five specimens $1\frac{1}{4}$ to $3\frac{3}{8}$ inches long from Naos Island, Panama Bay, October 27, 1904. Seined, sand beach. M. C. Z. 29438 (10 specimens).

MUGILIDAE.

Mugil hospes JORDAN & CULVER.

Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 422, pl. 31. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 60.

Seventeen specimens $1\frac{1}{8}$ to $1\frac{5}{8}$ inches long from Station 4596, Lat. 16° 47′ N.; Long. 100° 27′ W., October 14, 1904. M. C. Z. 29543 (7 specimens). Scales strongly ctenoid.

Chaenomugil proboscideus (GÜNTHER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 816.
Mugil proboscideus GÜNTHER, Cat., 1861, **3**, p. 459.

Six specimens 3 to $3\frac{7}{8}$ inches long from beach at Culebra Island, October 27, 1904.

Two specimens M. C. Z. 29428, $2\frac{3}{4}$ and 3 inches long from Acapulco, February 28, 1905.

One specimen $2\frac{3}{8}$ inches long from Chatham Island, January 9, 1905.

Neomyxus ciliilabis (CUVIER & VALENCIENNES).

Mugil ciliilabis CUV. & VAL., Hist. Nat. Poiss., 1836, **11**, p. 112 (151).

Ten examples of this interesting species, $1\frac{5}{8}$ to $2\frac{5}{16}$ inches long from Chatham Island. M. C. Z. 29368 (1 specimen).

Head 3.5 in total length (without caudal); depth 3.78; eye 3.5 in head; snout 3.5; D. IV–I, $8\frac{1}{2}$; A. II, 10; scales 42 in longitudinal series, 12 in transverse series, counted downward and forward from front of 2nd dorsal; maxillary not nearly reaching eye; cilia on each lip in one row anteriorly and at least two rows posteriorly on sides; no vomerine or palatine teeth present.

Neomyxus chaptalii (Eydoux & Souleyet).

Mugil chaptalii Eydoux & Souleyet, Voyage Bonite. Zool., 1842, **1**, p. 171, pl. 4, fig. 1.
Chaenomugil chaptalii Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 140, fig. 49.

Twenty-six specimens $1\frac{15}{16}$ to $3\frac{3}{4}$ inches long from Manga Reva, Paumotus Islands, February 3, 1905. M. C. Z. 29449 (10 specimens).

SPHYRAENIDAE.

Sphyraena idiastes Heller & Snodgrass.

Proc. Wash. Acad. Sci., 1903, **5**, p. 190, pl. 2.

Four specimens $1\frac{7}{8}$ to $2\frac{3}{4}$ inches long from Chatham Island. M. C. Z. 29588 (2 specimens).

POLYNEMIDAE.

Polydactylus approximans (Lay & Bennett).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 829.
Polynemus approximans Lay & Bennett, Zool. Beechey's Voyage, 1839, p. 57.

One specimen $8\frac{1}{4}$ inches long from Panama City fish market.

Polydactylus opercularis (Gill).

Jordan & Evermann, Bull, **47**, U. S. Nat. Mus. 1896, pt. 1, p. 830.
Trichiodion opercularis Gill, Proc. Acad. Nat. Sci. Phil., 1863, p. 68.

Four specimens $5\frac{1}{8}$ to $6\frac{3}{8}$ and one specimen, No. 3136, $8\frac{3}{8}$ inches long from Panama Bay; one specimen, $9\frac{3}{4}$ inches long from Panama City fish market. M. C. Z. 29555 (3 specimens).

SYNGNATHIDAE.

Siphostoma californiensis (Storer).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1891, pt. 1, p. 764.
Syngnathus californiensis Storer, Proc. Bost. Soc. Nat. Hist., 1845, **2**, p. 73.

One specimen $2\frac{15}{16}$ inches long from Station 4571, Lat. 33°, 40′ N.; Long. 119°, 35′ W.

Dorsal rays 39, situated on $1 + 8\frac{1}{2}$ rings; body-rings 21; caudal rings about 45.

HOLOCENTRIDAE.

Myripristis occidentalis (Gill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 847.
Myriopristis occidentalis Gill, Proc. Acad. Nat. Sci., Phil., 1863, p. 87.

Plate 2, fig. 1.

Ten specimens $4\frac{1}{2}$ to 6 inches long and eighteen specimens $2\frac{1}{8}$ to $2\frac{5}{8}$, from Acapulco. M. C. Z. 29709 (5 specimens).

Two specimens $\frac{15}{32}$ and $\frac{1}{2}$ inches long from Station 4615, Lat. 9°, 7′ N.; Long. 85°, 11′ W.

Myripristis microphthalmus Bleeker.

Verh. Bat. Genoot, 1852, **24**, p. 261. Atlas Ichth., 1877, **9**, tab. 358, Trachichth., 4, fig. 2.

Three specimens, Nos. 3305, 3306, 3307, M. C. Z. 29670, $5\frac{7}{8}$ to $6\frac{7}{16}$ inches long from Rikitea, Manga Reva.

One specimen $5\frac{11}{16}$ inches long from Manga Reva, February 1, 1905, coral.

These agree with specimens from Samoa, identified as this species by Jordan and Seale.

Measurements.

	No. 3305	No. 3306	No. 3307	Manga Reva
Total length in inches	$5\frac{1}{16}$	$6\frac{7}{16}$	$5\frac{7}{8}$	$5\frac{1}{16}$
Head in length without caudal	3.05	3.17	3.02	3.08
Depth in length without caudal	2.20	2.24	2.22	1.96
Eye in head	2.29	2.27	2.29	2.31
Interorbital in head	3.71	3.72	3.54	3.70
Scales	$3\frac{1}{2}$–28+4–$5\frac{1}{2}$	$3\frac{1}{2}$–28+4–$5\frac{1}{2}$	$3\frac{1}{2}$–28+4–$5\frac{1}{2}$	$3\frac{1}{2}$–28+4–$5\frac{1}{2}$
Dorsal	X–i, 16	X–i, 16	X–I, 16	X–I, 16
Anal	IV, 14	IV, 14	IV, 14	IV, 14
Maxillary denticulations	none	present	none	R. none L. 4 large blunt.
Edge of opercle	dusky	not dusky	dusky	dusky
Axil pectoral	black	black	black	black

Myripristis pralinius Cuvier & Valenciennes.

Hist. Nat. Poiss., 1829, **3**, p. 127 (170). Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 222.

Eight specimens, Nos. 3188–95, $6\frac{5}{8}$ to 9 inches long from Cook Bay, Easter Island No. 3193, M. C. Z. 29624, No. 3194, M. C. Z. 29625, No. 3195, M. C. Z. 29620.

The description and figure of *M. sanguineus* given by Jordan and Seale is erroneous. We have examined and measured the Type, U. S. Nat. Mus. No.

51721, $7\frac{1}{8}$ inches long and find it differs from the measurements given by Jordan and Seale as follows: — head 3.08 instead of 3.40 in length; eye 2.19 instead of 2.50 in head; dorsal X–1, $15\frac{1}{2}$ instead of X–1, 14 (15 in figure); anal IV, $14\frac{1}{2}$ instead of IV, 13 (14 in figure); interorbital 3.53 instead of 3.85 in head.

The patch of enlarged blunt outer teeth on each side of upper and lower jaw referred to by Jordan and Seale are very probably sexual or breeding tubercles since they are not constant, and are found in other species. If, however, they refer to the presence or absence of true outer enlarged teeth in the maxillary, these also are not characteristic, since they are present in varying degree in all the specimens we have examined. The dentition on the lower posterior margin of maxillary is not characteristic, it may or may not be present; in some specimens it is found on one side and not on the other.

The following comparative measurements, of eight examples here identified as *M. pralinius* from Cook Bay, Easter Island, three examples from Samoa (identified as such by Jordan and Seale), the Type of *M. sanguineus* from Samoa and the Type of *M. symmetricus* from Hawaii, show such slight differences in essential characters that we are unable to separate the species.

Proportional measurements of M. pralinius from Cook Bay.

	No. 3188	No. 3189	No. 3190	No. 3191
Head in length without caudal	2.94	2.96	3.07	3.08
Depth in length without caudal	2.64	2.69	2.56	2.67
Eye in head	2.03	2.04	2.19	2.14
Maxillary teeth on lower edge	R–L 7–4	R–L 2–7	R–L 8–2	none
Interorbital in head	4.07	4.08	3.73	3.75
Scales	$3\frac{1}{2}$–38+3–7	$3\frac{1}{2}$–38+3–7	$3\frac{1}{2}$–37+4–7	$3\frac{1}{2}$–36+4–7
Dorsal	X–1, $15\frac{1}{2}$	X–1, $15\frac{1}{2}$	X–1, $15\frac{1}{2}$	X–1, $15\frac{1}{2}$
Anal	IV, 13	IV, 13	IV, $13\frac{1}{2}$	IV, 14
	Dusky punctulations on tip of anal.		Dusky punctulations on tip of soft dorsal and anal.	

Proportional measurements of M. pralinius from Cook Bay.

	No. 3192	No. 3193	No. 3194	No. 3195
Head in length without caudal	2.92	2.94	2.68	2.96
Depth in length without caudal	2.50	2.54	2.30	2.62
Eye in head	2.03	2.07	2.14	2.07
Maxillary teeth on lower edge	R. bunched 11 of them. L. single row of 11.	R. group of 9. L. group of 20.	R–L 12–4	R–L 11–7

Proportional measurements of M. pralinius from Cook Bay. Continued.

	No. 3192	No. 3193	No. 3194	No. 3195
Interorbital in head	3.78	3.86	4.07	4.23
Scales	3½–37+3–7	3½–36+3–7	3½–38+3–7	3½–38+4–7
Dorsal	X–1, 15½	X–1, 15½	mutilated	X–1, 15½
Anal	IV, 14	IV, 15	IV, 13½	IV, 13½
	Dusky punctulations on tip soft dorsal and anal.	Dusky punctulations on tip dorsal.	Dusky punctulations on tip anal.	Dusky punctulations on anal and soft dorsal.

Proportional measurements.

	M. sanguineus Samoa Type U. S. N. M. No. 51721	*M. symmetricus* Hilo, Hawaii Type U. S. N. M. No 50630
Length in inches	7⅛	5½
Head in length without caudal	3.08	3.35
Depth in length without caudal	2.40	2.53
Eye in head	2.19	2.12
Maxillary teeth on lower edge	R–L 4–3	none
Interorbital in head	3.53	3.40
Scales	3½–37+–7	3½–36+4–7
Dorsal	X–1, 15½	X–1, 15
Anal	IV, 14½	IV, 13½
	Teeth like tubercles present on outer edge of upper and lower jaw.	

Proportional measurements of M. pralinius from Apia, Samoa.

Length in inches	5⅜	5¼	5⅛
Head in length without caudal	3.11	3.11	
Depth in length without caudal	2.48	2.58	
Eye in head	2.11	2.	
Maxillary teeth on lower edge	R–L 5–4	R–L 7–5	R–L 0–5
Interorbital in head	3.42	4.	
Scales	3½–36+4–7	3½–40–7	3½–38+ –7
Dorsal	X–1, 15½	X–1, 15½	X–1, 15½
Anal	IV, 14½	IV, 14½	IV, 15½
	Tooth-like tubercles present on outer edge of upper and lower jaw.		No tooth-like tubercles present on outer edge of upper and lower jaw.
		Dorsal and anal dusky at tips.	

Myripristis multiradiatus GÜNTHER.

Fische der Südsee, 1874, **3**, p. 93. JORDAN & EVERMANN, Bull. U. S. Bur. Fish., 1905, **23**, pt. 1, p. 49.

A specimen, No. 3308, 5 inches long from Rikitea, Manga Reva agrees with one collected by Jordan and Evermann at Honolulu, and also with their description of the species (Bull. U. S. Bur. Fish. **23**). The measurements of our specimen are as follows: —

Head 3.05 in length without caudal; depth 2.29 in length without caudal, eye 2.20 in head; interorbital 4.12 in head; dorsal X–1, $16\frac{1}{2}$; anal IV, $15\frac{1}{2}$ or 16; scales $3\frac{1}{2}$–40+3–$6\frac{1}{2}$; opercular margin black; axil black. The following; color note was found attached to the specimen: "General shade vermilion; edges of soft dorsal, caudal, ventral and anal white; brown-red bar from axil up across opercle, [vertical] bar through eye darker, bar cross preopercle."

Günther states that this species is closely related to *M. pralinius*, but it differs considerably from the form which we have identified as such.

Myripristis sealei JENKINS.

Bull. U. S. Fish Comm., 1904, **22**, p. 439, fig. 13.

Thirteen specimens, Nos. 3228–40, $5\frac{1}{2}$ to $6\frac{11}{16}$ inches long from Wreck Bay, Chatham Island. No. 3236, M. C. Z. 29621, No. 3237, M. C. Z. 29652, No. 3238, M. C. Z. 29622, No. 3239, M. C. Z. 29707, No. 3240, M. C. Z. 29626.

Owing to discrepancies in the description and figure, we have made measurements of the Type so that in comparing our specimens we may have the same personal equation.

Proportional measurements.

	Type	No. 3231	No. 3237	No. 3232
Head in length without caudal	3.17	3.00	3.10	3.08
Depth in length without caudal	2.63	2.69	2.75	2.53
Eye in head	2.26	2.37	2.22	2.30
Interorbital in head	3.77	3.80	4.21	4.60
Maxillary denticulation			none	7 on left 2 on right
Dorsal	X–1, $14\frac{1}{2}$	X–1, $14\frac{1}{2}$	X–1, $14\frac{1}{2}$	X–1, $14\frac{1}{2}$
Anal	IV, $12\frac{1}{2}$	IV, $12\frac{1}{2}$	IV, $12\frac{1}{2}$	IV, $12\frac{1}{2}$
Scales	4–37+–7	4–38+–7	4–37+–7	$3\frac{1}{2}$–38+–7
Length in inches	$5\frac{1}{4}$	$5\frac{1}{2}$	$5\frac{15}{16}$	$6\frac{11}{16}$

Some specimens have denticulations on the lower part of posterior maxillary, others do not, the Type has none; the anal is uniformly IV, $12\frac{1}{2}$; scales above

lateral line variable in the larger examples there being $3\frac{1}{2}$ including the one in lateral line, in the smaller 4. The interorbital width in head varies inversely as the size of the fish.

Holocentrus suborbitalis Gill.

Proc. Acad. Nat. Sci. Phil., 1863, p. 86. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 360.

Plate 2, fig. 2.

Seven specimens, Nos. 3344–48 and 3362–3, $5\frac{3}{8}$ to 7 inches long from Acapulco. No. 3344, M. C. Z. 29666, No. 3345, M. C. Z. 29667, No. 3346, M. C. Z. 29692, No. 3347, M. C. Z. 29619, No. 3348, M. C. Z. 29689.

Three specimens, Nos. 3144–5, $7\frac{1}{2}$ and $6\frac{5}{8}$ inches long and one untagged $6\frac{1}{2}$ inches long, among coral, all from Toboguilla Island, Bay of Panama.

Four specimens $1\frac{9}{16}$ to 6 inches long from Perico Island, Bay of Panama. M. C. Z. 29427 (3 specimens), 29554 (1 specimen).

Ten specimens, $\frac{1}{2}$ to $\frac{21}{32}$ inches long from Station 4619, Lat. 7°, 15′ N.; Long. 82°, 8′ W.

One specimen $\frac{17}{32}$ inches long from Station 4615, Lat. 9°, 7′ N.; Long. 85°, 11′ W.

One specimen, No. 3348, 7 inches long measures 147 mm. from tip of snout to base of caudal; head 3.2 in length without caudal; depth 2.5 in length without caudal; eye 2.8 in head; snout 4.0 in head; maxillary 2.25 in head; interorbital 4.5 in head; preopercular spine, measured on its upper edge, 3.75 in head; pectoral 1.29 in head; ventral 1.32 in head; 3rd anal spine 1.36 in head; dorsal XI–14; anal IV, 9; scales 4–38–8.

One specimen, No. 3227, 7 inches long from Wreck Bay, Chatham Island, differs slightly from the above example. It is a little deeper; the eye is slightly smaller; interorbital a little narrower; preopercular spine a little longer and 3rd anal spine somewhat shorter. Its length to base of caudal is 150 mm. and it has the following measurements: — Head 3.33 in length without caudal; depth 2.38 in length without caudal; eye 2.9 in head; snout 4.28 in head; maxillary 5.00 in head; interorbital 5.62 in head; preopercular spine, measured on its upper edge, 3.46 in head; pectoral 1.32 in head which equals the ventral; 2nd anal spine 1.55 in head; dorsal XI–14; anal IV, 9; scales 4–38–8.

Holocentrus punctatissimus Cuvier & Valenciennes.

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 162, fig. 60.
Holocentrum punctatissimum Cuv. & Val., Hist. Nat. Poiss., 1829, **3**, p. 160 (215).

One specimen $3\frac{1}{2}$ inches long from Easter Island.

Holocentrus diadema LACÉPÈDE.

Hist. Nat. Poiss., 1802, **4**, p. 335, 372, 374, pl. 32, fig. 3; JORDAN & SEALE, Bull. U. S. Bur. Fish., 1906, **25**, p. 225.

Two specimens, Nos. 3309–10, 5 and 5 $\frac{5}{16}$ inches long from Rikitea, Manga Reva.

In smaller specimens the spinous dorsal membranes and the axil of the pectoral are very dark brown; in larger specimens the membrane of the dorsal is lighter.

Five specimens, $4\frac{1}{4}$ to $5\frac{3}{4}$ inches long from Manga Reva, coral reef. M. C. Z. 29696 (2 specimens).

The fins of two of the smaller specimens and of the largest are typically colored, varying a little in intensity. In the other specimen the spinous dorsal is merely mottled and streaked with brown; the white marks on the anterior dorsal membranes are distinct, no black below white on first three membranes; the axil of the pectoral in the smallest specimens with a slightly brownish tinge formed of fine punctulations; the next in size has the axil about same on one side, darker on other; the third has the axil quite dark brown, and in the largest it is a very dark brown, almost black.

Holocentrus sammara (FORSKÅL).

JORDAN & EVERMANN, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 155, fig. 56.
Sciaena sammara FORSKÅL, Descrip. Anim., 1775, p. 48.

Four specimens Nos. 3296–99, $6\frac{3}{8}$ to $7\frac{3}{4}$ inches long, and three specimens $4\frac{7}{8}$ to $7\frac{3}{8}$ inches long from coral reef, all from Manga Reva. M. C. Z. 29703 (2 specimens).

Holocentrus opercularis (CUVIER & VALENCIENNES).

JORDAN & SEALE, Bull. U. S. Bur. Fish., 1906, **25**, p. 227.
Holocentrum operculare CUV. & VAL., Hist. Nat. Poiss., 1831, **7**, p. 377 (501).

Two specimens, No. 3294–3295, M. C. Z. 29669, 10 and $9\frac{1}{2}$ inches long from Rikitea, Manga Reva.

The body colors are more like those represented in Bleeker's Atlas, **9**, tab. 360, Trachichth., 6, fig. 5, of *H. sammara*, than of his figure of *H. operculare*, tab. 358, Trachichth, 4, fig. 3, and of Günther's figure of *H. operculare* in Fische der Südsee, taf. 66, fig. A. Our specimens agree very well with the color description given by Jordan and Seale (*loc. cit.*).

SCOMBRIDAE.

Scomberomorus sierra JORDAN & STARKS.

Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 428. GILBERT & STARKS, Mem. Cal. Acad., 1904, **4**, p. 68.

Two specimens $4\frac{1}{4}$ and $5\frac{9}{16}$ inches long from Panama Bay. M. C. Z. 29451 (1 specimen).

The larger specimen had the head 3.69 in length without caudal; depth 4.11; eye 4.14 in head; snout 2.90; maxillary 1.81; mandible 1.61; pectoral 2.23; soft dorsal 2.41; anal 2.41; dorsal XVII–I, 16–1–1–1–1–1–1–1–1; anal II–16–1–1–1–1–1–1–1. The other specimen had the head 3.91 in length without caudal; depth 4.94; eye 4.57 in head; snout 3.27; maxillary 1.77; mandible 1.65; pectoral 2.40; soft dorsal 2.18; anal 2.18; dorsal XVIII–I, 17–1–1–1–1–1–1–1–1; anal II–18–1–1–1–1–1–1–1.

Soft dorsal, in larger specimen, is separated by a slight space; in smaller specimen there seems to be no separation. The insertion of the dorsal in both is somewhat in advance of the origin of the anal.

Color in spirits; — brownish on back with bluish reflections; bright silvery on sides; a small dusky area on lower posterior margin of orbit; spinous dorsal with the membrane between the 1st and 4th entirely black, this color extending on to membrane between 4th and 5th, from about middle of 4th to near tip of 5th thence continued as a narrow black margin along rest of fin; caudal yellowish with dusky punctulations, these thickest on lobes and terminal margins; other fins yellowish with dusky punctulations; no spots anywhere.

CARANGIDAE.

Naucrates ductor (LINNÉ).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 900.
Gasterosteus ductor LINNÉ, Syst. Nat., ed. 10, 1758, p. 295.

One specimen M. C. Z. 29612, $\frac{3}{4}$ inch long from surface at Station 4706, Lat. 14°, 18.7′ S.; Long. 98°, 45.8′ W.

Dorsal IV–I, 29; anal II–I, 16.

Another specimen $1\frac{1}{4}$ inches long from Station 4704, Lat. 16°, 55.3′ S.; Long. 100°, 24.6′ W. D. IV–1, 29; A. II–I, 17.

One specimen $2\frac{1}{2}$ inches long from Station 4703, Lat. 17°, 18.6′ S.; Long. 100°, 52.3′ W.

These specimens are only provisionally identified with this species, as they are too small for certain identification.

Platystethus cultratus (Bloch & Schneider).

Günther, Cat., 1860, **2**, p. 391.
Sciaena cultrata Forster, MS.
Cichla cultrata Bloch & Schneider, Syst. Ichth., 1801, p. 343.

Plate 2, fig. 3.

No. 3198, a specimen $9\frac{1}{4}$ inches long from Cook Bay, Easter Island. Dorsal VIII–I, 27; anal II–I, 32; head 4 in length; depth 3.12; eye 3.50 in head; snout 3.25; maxillary 2.77; pectoral 1.38; ventral 2.77; longest dorsal spine (fifth) 4.34; scales 6–53 (57)–11, counted from origin of soft dorsal downward and forward to lateral line there are 8, counted from origin of spinous dorsal downward and backward to lateral line there are 6, below the lateral line, counted downward and forward to anal there are 11; if all the scales are counted in the lateral line there are 57.

Color dark slaty and brownish above, lighter on the sides, silvery below; longitudinal dusky streaks following the rows of scales, those in axis of body continuing to base of caudal, successively shorter to the one on a line from about the base of pectoral, which one terminates under about the 6th dorsal ray; each row of scales on the sides of abdomen is streaked with white.

In our specimen the maxillary reaches the anterior margin of eye.

Decapterus sanctae-helenae (Cuvier & Valenciennes)

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1. p. 908.
Caranx sanctae-helenae Cuv. & Val., Hist. Nat. Poiss., 1833, **9**, p. 28 (37).

One example, No. 3184, $12\frac{1}{4}$ inches long from Easter Island.

Head 3.8 in length; depth about 5; eye 3.27 in head; snout 3.13; pectoral 1.38; dorsal VII–I, 30; anal II–1, 26–1; scutes 34.

Provisionally identified with this species although it differs somewhat from current descriptions.

Hemicaranx atrimanus (Jordan & Gilbert).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 913.
Caranx atrimanus Jordan & Gilbert, Bull. U. S. Fish. Comm., 1882, **1**, p. 308.

Three specimens $7\frac{3}{8}$–$7\frac{3}{4}$ inches long from Panama Bay. M. C. Z. 29654 (1 specimen).

These specimens give the following measurements; —

Total length in inches	$7\frac{3}{4}$	$7\frac{5}{8}$	$7\frac{3}{8}$
Length without caudal	150 mm.	148 mm.	141 mm.
Head in length without caudal	3.57	3.79	3.52
Depth without caudal	2.28	2.20	2.16
Eye in head	3.81	3.90	4.21
Snout in head	3.81	3.71	3.80
Maxillary in head	3.23	3.12	3.07
Mandible in head	2.47	2.78	2.50
Pectoral in head	2.58	2.59	2.66
Length of arch in straight part of lateral line	2.08	2.14	2.
Height of arch in its length	2.99	2.91	3.08
Height of soft dorsal in head	1.68	1.56	1.80
Height of anal	1.71	1.77	2.
Dorsal	VIII–I, 27	VIII–I, 28	VIII–I, 27(28)
Anal	II–I, 24	II–I, 24	II–I, 24
Scutes in lateral line	58	58	58
	6 or 7 cross-bars; dusky area on base of pectoral large.	Same colors as first.	

Hemicaranx zelotes GILBERT.

Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2845. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, 4, p. 76, pl. 12, fig. 22.

One specimen $7\frac{5}{8}$ inches long from Panama Bay.

This specimen had the head 3.84 in length without caudal; depth 2.72; eye 3.25 in head; snout 3.90; maxillary 3.25; mandible 2.78; pectoral 3.40 in length; length of chord of arch 2.59 in straight part of lateral line; height of arch 2.90 in length of chord; height of soft dorsal 1.95 in head; height of anal 2.00; dorsal VIII–I, 28; anal II–I, 24; scutes in lateral line 53. No cross-bars; base of pectoral dusky.

Hemicaranx leucurus (GÜNTHER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 914.
Caranx leucurus GÜNTHER, Proc. Zool. Soc. London, 1864, p. 24.

One specimen $2\frac{1}{16}$ inches long from Panama Bay.

This specimen had the following measurements — head 3.03 in length; depth 2.20; eye 3.62 in head; snout 3.62; maxillary 2.63; mandible 2.23; pectoral broad and rounded, 4.40 in length; height of first soft dorsal ray 1.81; height first anal ray 2.07 in head; length of chord of arch of lateral line 2, in straight portion; height of chord 2.62 in arch; dorsal VIII–I, 28; anal II–I, 24; scutes 52. Preopercles strongly serrated, front of vertical fins rounded, first rays not highest; opercle dusky; pectoral yellowish, without blotch; dorsal anal, and caudal without dusky margins; five cross-bars, quite distinct.

Caranx hippos (Linné).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 432. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 77.
Scomber hippos Linné, Syst. Nat. ed. 12, 1766, **12**, p. 494.

Two specimens $3\frac{9}{16}$ and 6 inches long from Panama Bay. M. C. Z. 29702, (1 specimen).

Caranx caballus (Günther).

Trans. Zool. Soc. London, 1869, p. 431. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 78.

One individual, No. 3125, $11\frac{3}{4}$ inches long from Panama.

Caranx marginatus Gill.

Proc. Acad. Nat. Sci. Phil., 1866, p. 166. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 78.

Two specimens, No. 3352 and 3353, M. C. Z. 29665, $10\frac{1}{4}$ and 11 inches long from Acapulco.

One specimen, No. 3126, 11 inches long from Panama.

One specimen, M. C. Z. 29403, $4\frac{5}{8}$ inches long from Perico Island, Panama Bay, two fathoms.

Three specimens M. C. Z. 29589, each about $\frac{7}{8}$ inches long from Station 4619, Lat. 7°, 15′ N.; Long. 82°, 8′ W.

Dorsal VIII–I, 19 in two of them, and anal is 16 and 15; in the third the dorsal is VIII–I, 20; anal 17; each one has 30 scutes; depth is about 1.88 in length; head about 2.83; eye about 2.40 in head.

General color silvery, somewhat punctulate with dusky, especially on top of head and back, and caudal peduncle; six rather broad dusky cross-bars on body, growing fainter below, the first under front of spinous dorsal, 6th across caudal peduncle; anterior portion of spinous dorsal black, rest of spinous dorsal translucent with dusky rays, all the other fins are colorless in one example and yellowish in others.

Caranx guara (Bonnaterre).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 926.
Scomber guara Bonn., Encycl., 1788, p. 139, pl. 58.

One specimen, No. 3197, M. C. Z. 29717, $15\frac{1}{4}$ inches long from Easter Island.

One specimen, No. 3172, about $21\frac{1}{4}$ inches long probably from Easter Island.

These specimens are provisionally identified as this species although the head is considerably longer than that given in the description by Jordan and Evermann (Bull. 47, U. S. Nat. Mus., p. 926).

No. 3197 has, head 2.89 in length; depth 2.76; eye 6.05 in head; snout 2.42; preorbital 6.81; width maxillary 1.63 in eye, not reaching eye; pectoral 2.86 in length; dorsal VIII–I, 25; anal II–I, 21; scutes twenty-four on each side; breast, cheeks, opercles, and top of head scaly; teeth in upper jaw, short, blunt, and in two irregular series, outer teeth slightly larger, one series on lower jaw; fine teeth on vomer and palatines.

No. 3172 has head 2.60 in length; depth 2.83; eye 6.44 in head; snout 2.40; preorbital 6.44; pectoral 1.14 in length; width maxillary 1.79 in eye; dorsal VIII–I, 25; anal II–I, 21; fins in both specimens with a narrow scaly sheath and scales similar; teeth in upper jaws like those of No. 3197, but in a single series in each jaw; no teeth on vomer, a series of very fine teeth on palatines.

Vomer setapinnis (Mitchill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 934, 1900, pt. 4, pl. 144, fig. 392.
Zeus setapinnis Mitchill, Trans. Lit. & Philos. Soc. N. Y., 1815, **1**, p. 384, pl. 1, fig. 9.

Three specimens $6\frac{1}{4}$–$6\frac{1}{2}$ inches long from Panama Bay. M. C. Z. 29710 (1 specimen).

Chloroscombrus orqueta Jordan & Gilbert.

Proc. U. S. Nat. Mus., 1883, **5**, p. 646. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 938.

Two specimens $5\frac{3}{8}$ and $6\frac{1}{4}$ inches long from Panama Bay. M. C. Z. 29715 (1 specimen).

Trachinotus rhodopus Gill.

Proc. Acad. Nat. Sci. Phil., 1863, p. 85. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 82.

One specimen, No. 3119, 11 inches long from Panama.

The prolonged vertical fins reach much beyond middle of caudal.

Three specimens $1\frac{1}{4}$ and $1\frac{7}{16}$ inches long from Perico Island, dredged near shore in two fathoms. M. C. Z. 29545 (2 specimens).

One specimen $1\frac{1}{4}$ inches long from Station 4596, Lat. 16°, 47′ N.; Long. 100°, 27′ W.

NOMEIDAE.

Nomeus gronovii (Gmelin).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 949.
Gobius gronovii Gmelin, Syst. Nat., ed. 13, 1789, **1**, pt. 3, p. 1205.

Two specimens, $\frac{3}{4}$ to $\frac{15}{16}$ inches long from surface at Station 4542, Lat. 14°, 50′ N.; Long. 101°, 31′ W. M. C. Z. 29613 (1 specimen).

CORYPHAENIDAE.

Coryphaena hippurus Linné.

Syst. Nat., ed. 10, 1758, p. 261. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 952.

One specimen $\frac{7}{8}$ inch long from Station 4615, Lat. 9°, 7′ N.; Long. 85°, 11′ W.

? Coryphaena equisetis Linné.

Syst. Nat., ed. 10, 1758, p. 261. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 953.

One specimen, M. C. Z. 29595, $\frac{11}{16}$ inch long from surface at Station 4727, Lat. 13°, 03′ S.; Long. 112°, 44.9′ W.

One specimen $1\frac{1}{8}$ inches long from surface at Station 4716, Lat. 2°, 18.5′ S.; Long. 90°, 2.6′ W.

Four specimens $\frac{3}{4}$–$\frac{7}{8}$ inches long from surface at Station 4729, Lat. 14°, 15′ S.; Long. 115°, 13′ W.

One specimen, M. C. Z. 29601, $1\frac{1}{16}$ inches long from surface at Station 4619, Lat. 7°, 15′ N.; Long. 82°, 8′ W.

CENTROPOMIDAE.

Centropomus robalito Jordan & Gilbert.

Proc. U. S. Nat. Mus. 1882, **4**, 462. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 94, pl. 13, fig. 25.

One specimen $9\frac{1}{4}$ inches long from Panama City Fish Market.

CHEILODIPTERIDAE.

Amia exostigma Jordan & Starks.

Jordan & Starks, Bull. U. S. Bur. Fish., 1906, **25**, p. 238, fig. 3.

Three specimens $3\frac{5}{16}$–$4\frac{7}{8}$ inches long from Manga Reva, coral. M. C. Z. 29432 (1 specimen).

Proportional measurements.

				Type
Total length in inches	$4\frac{7}{8}$	$4\frac{3}{4}$	$3\frac{5}{16}$	$2\frac{5}{8}$
Length without caudal	102 mm.	97 mm.	67 mm.	57 mm.
Head in length without caudal	2.78	2.77	2.68	2.85
Depth	3.18	3.03	3.19	3.80
Eye in head	3.36	3.18	3.12	2.85
Snout in head	3.21	3.50	3.57	3.33
Maxillary in head	2.31	2.18	2.	2.22
Interorbitals in head	5.28	5.83	5.25	5.71
Dorsal	VII–I, 10	VII–I, 10	VII–I, 10	VII–I, 10
Anal	II, 9	II, 9	II, 9	II, 9
Scales	3–25–5	3–25–5	3–25–5	3–25–5

In the largest specimen, the orbital rims have, except in front, strong denticulations, those below the eye the largest, some of which are bifid and trifid, and one on each side broad cusp-like with four or five points; lateral stripe from tip of snout through eye and across opercle broad and distinct, on the body very faint; above this another scarcely distinguishable stripe coalescing with the lower posteriorly at end of downward curve of lateral line; caudal spot small.

In the $4\frac{3}{4}$ inch specimen the orbital rim is not strongly toothed, very few above and the stronger ones below are nearly all single. Coloration as in the larger specimen.

In the smallest specimen the coloration differs in having the median lateral stripe more distinct; the one above is not evident and the caudal spot is larger; no teeth about eye, except on lower margin, these all strong, sharp, and single.

These specimens have a different physiognomy from *A. frenata* and *A. snyderi*; mouth nearly horizontal and body somewhat more elongate.

In the Type the lateral stripe is very much more distinct; large, sharp, single serrations on lower orbital rim. It differs from *A. frenata* and *A. snyderi* in being more slender, with a somewhat different physiognomy, more nearly horizontal mouth, and also in color.

Amia savayensis (Günther).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 239, fig. 33.
Apogon savayensis Günther, Proc. Zool. Soc. Lond., 1871, p. 656.

Twenty-seven specimens $3\frac{1}{2}$ to $4\frac{3}{8}$ inches long from Manga Reva, among coral. M. C. Z. 29552 (10 specimens).

The following color note was found among these specimens:— "Pearly iridescence throughout, dark shades on edges of caudal and dorsal; maxillary yellowish from streak."

Amia erythrina (Snyder).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 245.
Apogon erythrinus Snyder, Bull. U. S. Fish Comm., 1904, **22**, p. 526, pl. 9, fig. 17.

One specimen $1\frac{11}{16}$ inches long from coral reef at Manga Reva.

Head 2.64 in length without caudal; depth 2.64; eye 2.94 in head; snout 3.84; interorbital 3.57; maxillary 2; length of caudal peduncle 1.56; depth of caudal peduncle 2.50; second dorsal spine 1.56; dorsal VI–I, $9\frac{1}{2}$; anal II, $8\frac{1}{2}$ (9); scales $2\frac{1}{2}$–26–6; scales in front of dorsal 5.

Color in spirits: — general color dark straw, with dusky punctulations on edge of scales, back, and sides; these most numerous on nape and opercle and along base of the dorsal; pectoral pale; soft dorsal, caudal, and anal punctulate with black with broad blackish margins; ventral pale, with dusky terminal margins.

Amia doryssa JORDAN & SEALE.

JORDAN & SEALE, Bull. U. S. Bur. Fish., 1906, **25**, p. 245, fig. 39.

One specimen $1\frac{3}{4}$ inch long from Manga Reva, coral.

This specimen has, head 2.61 in length; depth 2.83; eye 2.60 in head; snout 4.72; interorbital 4.87; maxillary 1.71; 2nd dorsal spine 1.25; dorsal VI–I, 10; anal II, 9; scales 2–25–6.

Amia dovii (GÜNTHER).

Apogon dovii GÜNTHER, Proc. Zool. Soc. London, 1861, p. 371. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 88.

Four specimens $1\frac{5}{8}$ to $2\frac{1}{2}$ inches long from Perico Island, Panama Bay. M. C. Z. 29423 (2 specimens).

Amia atradorsata (HELLER & SNODGRASS).

SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 367.
Apogon atradorsatus HELLER & SNODGRASS, Proc. Wash. Acad. Sci., 1903, **5**, 192, pl. 3.

One hundred and twenty specimens $2\frac{1}{4}$ to $3\frac{5}{16}$ inches long from Chatham Island, shore. M. C. Z. 29417 (20 specimens).

We have identified these specimens as *A. atradorsata* because of the presence of the black tip on soft dorsal; this character varies (in our specimens) from very slightly dusky to jet black, and seems a slight, though the only apparent, difference between it and *A. atricauda*.

Two of the larger specimens had eggs and young Amias in their mouths, one of them had "eyed" eggs and the other young fish.

Amia retrosella GILL.

GILL, Proc. Acad. Nat. Sci. Phil., 1862, p. 251.
Apogon retrosella JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 1108.

Many specimens, $\frac{15}{16}$ to $3\frac{1}{8}$ from Acapulco, February 25, 1905.

Seventeen specimens, $1\frac{13}{16}$ to $3\frac{3}{8}$ from Acapulco, February 28, 1905. M. C. Z. 29455 (10 specimens).

Fowleria isostigma (JORDAN & SEALE).

Apogonichthys isostigma JORDAN & SEALE, Bull. U. S. Bur. Fish., 1906, **25**, p. 251, fig. 45.

Four specimens 3 to $4\frac{3}{4}$ inches long from Manga Reva, coral. M. C. Z. 29542 (2 specimens).

These specimens are identifiable with the Types of *Apogonichthys isostigma*, in the U. S. National Museum, but they differ somewhat from the description of Jordan and Seale. They state that "This species is nearest *Apogonichthys polystigma* Bleeker, but that it does not seem to agree with Bleeker's account." The chief discrepancies, which are doubtless due to the personal equation of the observers, in these two descriptions are, in Bleeker's description, the larger eye, more numerous scales and the two jaws are equal; his figure shows a little longer lower jaw, the dusky line from back of eye extending more obliquely downward and backward and the body spots not so well defined. In the Types as well as in our specimens, the eye (orbit) is not so small as indicated by Jordan and Seale, or so large as stated by Bleeker, and the scales, according to our method of counting, in both our specimens and the Type agree with Bleeker's count. When the mouth is partly open, the jaws appear equal, although when closed, the lower is included, which tends to make *F. isostigma* still nearer to *A. polystigma*. But in his Atlas Bleeker includes *A. polystigma* in the genus Amia, which he states has palatine teeth; *F. isostigma* has no palatine teeth.

We give the following comparative measurements of our four specimens, of the Type?, and two cotypes of *F.* (*Apogonichthys*) *isostigma*, together with measurements taken from Bleeker's figure of *F.* (*Apogonichthys*) *polystigma*.

Specimens from Manga Reva.

Total length in inches	$4\frac{3}{16}$	$3\frac{11}{16}$	3	3
Length without caudal	89 mm.	78 mm.	63 mm.	63 mm.
Head in length without caudal	2.87	2.69	2.73	2.62
Depth in length without caudal	2.96	3.12	3.15	3.15
Orbit in head	3.66	3.62	3.28	3.42
Snout in head	4.40	4.14	3.83	4.8
Interorbital in head	6.	7.25	6.54	6.85
Maxillary	1.73	1.93	1.77	1.92
Dorsal	VII–I, 10	VII–I, 9	VI–I, 9	VII–I, 9
Anal	II, 9 (8)	II, 8	II, 9	II, 9 (8)
Scales	3–25+1–6	3–25+1–6	3–25+1–6	3–25+1–6

	Fowleria (Apogonichthys) isostigma.[1]			*Apogonichthys polystigma.*
	Cotype ?	Cotype ?	Type ?	Bleeker's figure
Total length in inches	$3\frac{1}{8}$	$2\frac{9}{16}$	$2\frac{5}{8}$	
Length without caudal	70 mm.	53 mm.	53 mm.	61 mm.
Head in length without caudal	2.69	2.65	2.52	2.44
Depth without caudal	3.04	3.11	2.94	2.90
Orbit in head	3.71	3.33	3.50	3.57
Snout in head	4.33	4.	4.20	5.
Interorbital in head	6.50	6.66	7	
Maxillary	1.85	1.81	1.91	2.08
Dorsal	VI–I, 9	?–9	?–9	
Anal	II, 9	?–9	?–9	
Scales	3–25+1–6	3–25+1–6	3–25+1–6	

In the Manga Reva specimens all have the soft dorsal, caudal, and anal with a pale yellowish margin; it is also evident in some of the Type specimens, although it is not mentioned in the description or figure. Bleeker does not mention such a character in *A. polystigma.*

On two of our Manga Reva specimens the lateral line for its entire extent has fully developed tubes to the base of caudal; in the other two specimens, they are rudimentary posteriorly, as in the Types and as described by Bleeker for *A. polystigma.*

Paramia lineatus (Lacépède).

Cheilodipterus lineatus Lac., Hist. Nat. Poiss., 1802, **3**, p. 542.
Paramia macrodon Jordan & Seale, Bull. U. S. Bur. Fish., 1905, **25**, p. 252.

One specimen $6\frac{7}{8}$ inches long from Manga Reva.

KUHLIIDAE.

Kuhlia nutabunda, sp. nov.

Plate 3, fig. 1.

Type No. 65551, U. S. Nat. Mus., $5\frac{7}{8}$ inches long, and 90 cotypes $1\frac{1}{8}$ to 4 inches long, all from Easter Island. M. C. Z. 29572 (37 specimens).

The type has the following measurements: —

Head 3.21 in length without caudal; depth 2.70; eye 2.64 in head; snout 3.70; maxillary 2.31; mandible 1.94; interorbital 3.45; dorsal IX–I, 11; fourth

[1] Jordan and Seale state that the Type is No. 51736 U. S. National Museum and that it is 2.67 inches long. The bottle bearing this number and labelled Type of *Apogonichthys isostigma* in U. S. National Museum contained three specimens with a loose number tag. None of these specimens agree with the stated length, but the one that is nearest is marked type in the above table.

spine longest, 2.05 in head; longest soft ray 2.31; base of soft dorsal 1.85; anal III, 11, second anal spine equal in length to the third, 3.70 in head; longest anal ray 2.64, anal base 1.68; pectoral 1.54; scales 8(9)–52–12. In the transverse series from lateral line downward and backward to anal there are fourteen scales; downward and forward fourteen. The ascending limb of preopercle is finely serrated for some distance above the angle.

Color in spirits: — top of head and back very dusky, quite intense on tip of snout and lower lip; below lateral line soiled silvery gray; dorsal dusky, most intense on outer margin; tip of anterior rays pale; anal similar; pectoral and ventral yellowish, punctulate with black; caudal very dusky, with black terminal margins.

A cotype 4 inches long has the following measurements: —

Head 3.11 in length without caudal; depth 3.11; eye 2.88 in head; snout 3.71; maxillary 2.36; mandible 1.92; interorbital 3.47; dorsal IX–I, 11; fourth dorsal spine longest, 1.92 in head; base of soft dorsal 1.85; longest ray 2.09; anal III, 11; second anal spine equals third, 3.05; base of anal 1.52, longest ray 2.60; pectoral 1.52; scales 8–52–12. *K. nutabunda* differs most conspicuously from *K. sandvicensis* and *K. marginata* in that it has a much larger eye, and *K. marginata* has fewer scales in transverse and longitudinal series. In general it is somewhat more slender than *K. sandvicensis* from the Paumotus, in this respect being more like Hawaiian specimens; the head is not so long as in *K. proxima*.

This species in general appearance closely resembles specimens of *Kuhlia sandvicensis* from Hawaii and also specimens which we have identified as *K. sandvicensis*. They are closely related to *Kuhlia proxima* Kendall and Goldsborough (Bull. M. C. Z., 1911, **26**, p. 282) from Fiji, and to *K. marginatus*.

In two of the specimens of the present species the eye varies considerably and affords no distinctive character, but it appears larger than in *K. sandvicensis*.

Kuhlia sandvicensis (STEINDACHNER).

Moronopsis argenteus var. *sandvicensis* STEINDACHNER, Sitzb. Ak. Wiss. Wein, 1876, **74**, p. 206 (Beiträge, 5, p. 158).

Moronopsis sandvicensis STEINDACHNER, Sitzb. Ak. Wiss. Wein, 1887, **96**, p. 56 (Beiträge, 14, p. 1), taf. 1, fig. 1.

Five specimens $2\frac{7}{16}$–$2\frac{7}{8}$ inches long from Manga Reva, February 3, 1905, M. C. Z. 29440 (2 specimens).

SERRANIDAE.

Acanthistius cinctus (Günther).

Boulenger, Cat. 1895, **1**, p. 142, pl. 1.
Plectropoma cinctum, Günther, Cat. 1859, **1**, p. 162, pl. 13, fig. A.

One specimen $5\frac{13}{16}$ inches long from Easter Island, shore.

Trachypoma macracanthum Günther.

Cat. 1859, **1**, p. 167. Boulenger, Cat. 1895, **1**, p. 146, pl. 2.

Two specimens, No. 3173, M. C. Z. 2965, $7\frac{7}{8}$ inches long and No. 3174, $8\frac{1}{4}$ inches long from Cook Bay, Easter Island.

No. 3173 has head 2.31 in length without caudal; depth 2.55; eye 3.6 in head; snout 4.8; 5th dorsal spine longest, 2.32 in head; 2nd anal spine longest, strong, and stout, 2.25 in head; dorsal XII, 14; anal III, 6.

Many of the scales are ciliated but only a few are ciliated in No. 3174, the latter specimen agrees in other particulars with No. 3173.

No. 3173, was in life, brilliant orange, splotched with lighter shades; dark spots in centre of margin of soft dorsal; small white spots over body; branchiostegal membranes with brassy shades, the extended central margin of caudal brown, rest of margin darker.

Petrometopon panamensis (Steindachner).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 1141.
Serranus panamensis Steindachner, Sitzb. Ak. Wiss. Wien, 1875, **72**, p. 551 (Beiträge, 4, p. 1), taf. 1, fig. 1.

Three specimens from Panama, No. 3127, $9\frac{1}{8}$, 3146, M. C. Z. 29681, $9\frac{7}{8}$, 3147, M. C. Z. 29659, $7\frac{1}{4}$ inches long.

Three specimens from Acapulco, No. 3332, $10\frac{1}{2}$, 3333, $9\frac{3}{4}$, 3339, M. C. Z. 29633, $10\frac{1}{2}$ inches long.

Three specimens $4\frac{3}{4}$ to $6\frac{3}{4}$ inches long from Toboguilla Island, from coral in two fathoms of water. M. C. Z. 29574 (1 specimen).

Epinephelus analogus Gill.

Proc. Acad. Nat. Sci. Phil., 1863, p. 163. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 96.

Two specimens, Nos. 3114 and 3143, M. C. Z. 29649, $12\frac{1}{2}$ and $9\frac{1}{2}$ inches long from Panama.

The round dark spots are not confined to the cross-bands, as described by Gilbert and Starks, there being a single cross-series on each interspace. Our specimens show distinctly only four cross-bands.

Epinephelus labriformis (JENYNS).

JORDAN, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 443. SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 367.
Serranus labriformis JENYNS, Zool. Voy. Beagle. Fish, 1842, pt. 4, p. 8, pl. 3.

One specimen, No. 3128, $7\frac{3}{4}$ inches long from Panama.

One specimen $4\frac{1}{2}$ inches long from Toboguilla Island among coral in two fathoms of water.

Two specimens $3\frac{5}{8}$ and $4\frac{7}{8}$ inches long from Perico Island, Panama Bay.

Two specimens, Nos. 3385–86, $6\frac{1}{4}$ and $7\frac{1}{8}$ inches long. No. 3386, M. C. Z. 29631 and two specimens $3\frac{11}{16}$ and $4\frac{1}{4}$ inches long from Acapulco.

One specimen $1\frac{9}{16}$ inches long from shore at Chatham Island. This specimen has a strong spine at lower angle of preopercle.

Specimen No. 3386 has, head 2.46 in length without caudal; depth 3.08; eye 4.61 in head; snout 4.61; interorbital 8; maxillary 2.22; mandible 1.87; D. XI, $16\frac{1}{2}$; A. III, 9; scales 10–95–40.

No. 3385 has, head 2.55 in length; depth 3.02; eye 4.72 in head; snout 4.72; interorbital 7.42; maxillary 2.16; mandible 1.79; D. XI, $17\frac{1}{2}$; A. III, $8\frac{1}{2}$; scales 10–106–42.

No. 3128 has, head 2.46 in length; depth 3.01; eye 4.64 in head; snout 4.64; interorbital 7.22; maxillary 2.16; mandible 1.80; D. XI, 17; A. III, $8\frac{1}{2}$; scales 10–100–40.

No. 3386 has two canines in right side of upper jaw and one on left side; lower jaw has none on right side of symphysis and one on the left; on the sides of the upper jaw the teeth are in bands, graduating back to not less than four rows; and on the lower jaw to two rows, these larger than those on upper jaw. No. 3385 has two canines on right side of upper jaw and none on left; lower jaw has one canine on each side of symphysis; rows on the sides of upper jaw same as in preceding; lower jaw has two rows on right side and one on left. No. 3128 has one canine on each side in upper and lower and more than four rows on each side of upper jaw and on lower jaw graduating back to two and then to one row at posterior end of jaw.

No. 3385, has comparatively few unciliated scales on body above lateral line, these are restricted to the region in front of line from in front of upper angle of opercle to about the base of 7th dorsal spine. In No. 3386, these scales occupy the region above the lateral line from a line in front of upper angle of opercle toward base of 4th dorsal spine, and thence in a narrow stripe, gradually decreasing in width to the middle of base of soft dorsal. In No. 3128, these scales have practically the same extent as in No. 3386.

Color of No. 3128 in alcohol: — general color brown, darker above, becoming lighter on belly; top of head and nape uniform brownish; fins, body, and underside of head mottled with lighter spots, these varying in size from mere points, to size of pupil, traces of dusky spots, mingled with the light spots; traces of five narrow dark bars extending on sides below dorsal, the first in front of spinous dorsal, 2nd below 5th to 7th spines, 3rd below junction of dorsals, 4th below middle of soft dorsal and 5th below posterior end of soft dorsal; a black saddle on dorsal surface of caudal peduncle; traces of four black spots along upper edge of caudal with interspaces lighter than the rest of fins; spinous and soft dorsal color of body, mottled with spots of same color as those on body but more indistinct; margins yellowish with an inframarginal darker band; caudal body color, with yellow margin, mottling very indistinct; anal similar to soft dorsal; ventral rays body color, membrane lighter; upper and lower margins tinged with lighter; inner surface of pectoral color of body, outer surface lighter, with a tawny dusky yellowish margin shading into the darker body color at the base; the fin is mottled similar to body.

We can not distinguish our specimens from *Epinephelus hoevenii* Bleeker as described and figured in his Atlas or from *E. daemelii* as described and figured by Boulenger in his Catalogue or from *S. tumilabris* as described and figured by Day in his Fishes of India. *S. hoevenii,* in the Fishes of Zanzibar by Playfair and Günther also seem to be the same, but their *S. tumilabris* is evidently different, although they do not mention or figure the pale margins to the vertical fins in their *S. hoevenii.* Boulenger includes *S. hoevenii,* and *S. tumilabris* in the synonymy of *E. caeruleopunctatus* Bloch, but he regards *E. labriformis* and *E. daemelii* as distinct species. Our specimens agree somewhat better in most respects with *E. daemelii.* The *S. caeruleopunctatus* of both Bloch and Valenciennes are *sine patria* and their descriptions are insufficient for identification.

Epinephelus merra Bloch.

Ausl. Fische, 1793, **7**, p. 15, pl. 329. Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 258.

One specimen, No. 3289, $6\frac{1}{2}$ inches long and two specimens $6\frac{3}{8}$ and $6\frac{7}{8}$ inches long, all from Manga Reva. M. C. Z. 29713 (1 specimen).

Epinephelus socialis (Günther).

Boulenger, Cat., 1895, **1**, p. 243.
Serranus socialis Günther, Fische der Südsee, 1873, **1**, p. 7, taf. 8, fig. B.

One specimen, No. 3290, $7\frac{3}{4}$ inches long from Manga Reva.

Head 2.61 in length without caudal; depth 3.34; eye 5 in head; snout 5,

maxillary 2; mandible 1.71; interorbital 6.31; dorsal XI, 15½ (16); anal III; 8½ (9); scales downward and backward from front of spinous dorsal to lateral line 19, downward and backward from lateral line to front of anal 42, row above lateral line 100.

Our specimen agrees very closely in color with *Serranus socialis* Günther (*loc. cit.*, taf. 8, fig. B), except that the spots on the head and body, and the bars formed by confluent spots are smaller, more numerous, and more or less present from tip of pectoral back to caudal, the interspaces forming narrow pale rivulations.

Dermatolepis punctatus Gill.

Proc. Acad. Nat. Sci. Phil., 1861, p. 54. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 368.

Three examples from Acapulco, No. 3319, 6⅞ inches long; No. 3320, 8¾ inches long and No. 3341, M. C. Z. 29638, 8⅜ inches long.

Prionodes fasciatus Jenyns.

Zool. Voy. Beagle, Fish., 1842, pt. 4, p. 47, pl. 9, fig. 1. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 1212.

Seven specimens 2½–4½ inches long from Acapulco. M. C. Z. 29435 (3 specimens).

In the key to the genera of Serranidae Jordan and Evermann (*loc. cit.*, p. 1129–1130) place Prionodes in a group said to have no depressible teeth; in the generic description it is stated that "there are no depressible teeth in jaws." In our specimens some of the posterior premaxillary teeth and some of the lateral mandibular teeth are depressible. The prominence of the lower jaw varies somewhat; the caudal is slightly emarginate or truncate, and the upper rays somewhat produced, the prolongation varying somewhat in length.

Paranthias furcifer (Cuvier & Valenciennes).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 1222.
Serranus furcifer Cuv. & Val., Hist. Nat. Poiss., 1828, **2**, p. 196 (264).

Seven specimens, Nos. 3244–47, 3258, M. C. Z. 29675, No. 3259, No. 3260, M. C. Z. 29699, 5⅝ to 10⅞ inches long from Panama.

One hundred and four specimens 3 9/16 to 6¼ inches long from Toboguilla Island, Panama Bay. M. C. Z. 29553 (4 specimens). M. C. Z. 29636 (1 specimen).

Compared with a Clarion Island specimen, 2 or 3 inches longer than our largest specimen, the lower jaw in ours is a little more prominent; maxillary is a

little longer, reaching a little beyond middle of eye; eye a little larger; preopercular angle less salient, being nearly rounded. In the key to the genera of Serranidae Jordan and Evermann (*loc. cit.*, p. 1129–1130) place Paranthias in a group said to have no depressible teeth, but they have depressible teeth.

Rhegma thaumasium GILBERT.

Bull. 47, U. S. Nat. Mus., 1900, pt. 4, p. 3169. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 99, pl. 15, fig. 3.

Three specimens $1\frac{1}{4}$, $1\frac{9}{16}$ and $2\frac{1}{16}$ inches long from Toboguilla Island, Panama Bay, collected among coral at depth of two fathoms. M. C. Z. 29409 (1 specimen).

The larger specimen has head 2.75 in length; depth 3.66; eye 4 in head; snout 5.33; maxillary 1.77; D. VII, 22; A. III, 18; scales above lateral line in longitudinal series 50+, from origin of spinous dorsal downward and backward to lateral line $4\frac{1}{2}$; from lateral line downward and backward to origin of anal 21.

In the largest and the smallest specimens, the anterior nasal tube and the supraorbital flap are comparatively small, but in the intermediate specimen these are considerably larger.

In the largest specimen the general color is brown; throat, maxillary, cheek, lower opercle, and breast paler; a faint dusky blotch just behind lower part of eye; a large well-defined dark brown spot on upper part of opercle; body clouded with dark brown, with traces of longitudinal dusky lines along each row of scales; pectorals and ventrals dark gray; dorsal, anal, and caudal blue black, with narrow pale margins.

The other two specimens are essentially the same color as above, except that the smallest specimen is somewhat lighter than the other two.

LOBOTIDAE.

Lobotes pacificus GILBERT.

Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2857. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 100, pl. 14, fig. 28.

Two specimens $\frac{13}{16}$ and $\frac{14}{16}$ inches long from Station 4596, Lat. 16°, 47′ N.; Long. 100°, 27′ W.

The larger specimen has a general color of dark gray, mottled with darker; markings on head similar to those described by Gilbert; the stripe from eye downward and backward to gill-opening extends to behind the base of ventrals; a dark bar across front part of breast; ventrals dusky with pale inner margin;

soft dorsal and anal with white margins and three jet black spots size of pupil on the base of dorsal and two on base of anal; caudal with broad pale margin which occupies the terminal half of fin. The other specimen differs in having three spots at base of anal.

LUTIANIDAE.

Hoplopagrus guentherii Gill.

Proc. Acad. Nat. Sci. Phil., 1862, p. 253. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 101.

Two specimens $5\frac{1}{4}$ and $6\frac{1}{8}$ inches long from Acapulco. M. C. Z. 29698 (1 specimen).

Lutianus argentiventris (Peters).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 455. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 374.
Mesoprion argentiventris Peters, Monatsb. K. Akad. Wiss. Berlin, 1869, p. 704.

Three specimens, M. C. Z. 29561, No. 3340, $7\frac{1}{2}$ inches long; No. 3360, $11\frac{3}{8}$ inches long; No. 3361, M. C. Z. 29646, $10\frac{1}{4}$ inches long, and three specimens 6 to $7\frac{1}{8}$ inches long, all from Acapulco. Two specimens, $7\frac{1}{2}$ and $7\frac{3}{4}$ inches long from Toboguilla Island, Panama Bay, from among coral.

Lutianus guttatus (Steindachner).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 456. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 103.
Mesoprion guttatus Steindachner, Sitzb. Ak. Wiss. Wien, 1869, **60**, p. 18, taf. 8.

Four specimens, M. C. Z. 29553, $4\frac{5}{8}$ to $6\frac{1}{4}$ inches long from Perico Island, Panama Bay, in two fathoms of water.

Thirteen specimens $3\frac{3}{8}$ to $4\frac{7}{8}$ inches long from Acapulco.

The black spot on the side in all our specimens is much larger than the eye. The following color note was found among the Acapulco specimens: — "Lower stripes and belly brassy; back stripes brown; ventrals and anal brown; dorsal and caudal with a red margin; central spot black; snout pinkish."

The dorsal and caudal margins are now dusky.

Lutianus aratus (Günther).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 457.
Mesoprion aratus Günther, Proc. Zool. Soc. London, 1864, p. 145.

One specimen $5\frac{3}{8}$ inches long from Perico Island, Panama Bay.

Lutianus marginatus (Cuvier & Valenciennes).

Day, Fishes of India, 1875, p. 44, pl. 13, fig. 4.
Diacope marginata Cuv. & Val., Hist. Nat. Poiss., 1828, **2**, p. 320 (425).

One specimen, No. 3311, $12\frac{1}{2}$ inches long from Rikitea, Manga Reva.

Head including flap 2.68 in length; depth 2.52; eye 4.85 in head; snout 2.86; maxillary 2.48; pectoral not reaching front of anal, 1.16 in head; deep opercular notch, with opercular knob moderate.

Rabirubia inermis (PETERS).

JORDAN, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 457, pl. 39.
Mesoprion inermis PETERS, Monatsb. K. Akad. Wiss. Berlin, 1869, p. 705.

Twenty-seven specimens, $2\frac{5}{16}$ to $5\frac{1}{8}$ inches long from Acapulco, shore. M. C. Z. 29444 (10 specimens).

These specimens show a dusky spot on upper base of pectoral; the upper and lower caudal ray pale, the lower paler, almost white; other outer rays of caudal with dusky area, wide at base, tapering to the tips of the lobes; a yellowish band at base of caudal; these colors are most distinct in the smallest specimens, gradually becoming less distinct in the largest specimens; on each of the specimens there is an oblong faint bluish, iridescent, or pearly spot, in most specimens extending from posterior angle of soft dorsal downward and forward to lateral line, in others lying parallel with and close to the lateral line; some specimens have a small spot of similar color on the top of caudal peduncle.

Xenocys jessiae JORDAN & BOLLMAN.

Proc. U. S. Nat. Mus., 1890, **12**, p. 160. SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 375.

Five specimens, No. 3249–50, 3264–5, M. C. Z. 29639 and 3278, M. C. Z. 29711, $6\frac{1}{4}$ to $9\frac{1}{2}$ inches long from Wreck Bay, Chatham Island.

Xenichthys xanti GILL.

Proc. Acad. Nat. Sci. Phil., 1863, p. 82. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 103.

Four specimens $5\frac{3}{8}$ to $6\frac{7}{8}$ inches long from Perico Island, Panama Bay, in two fathoms of water. M. C. Z. 29421 (2 specimens).

This species is easily distinguished from *X. agassizii* by having a much shorter pectoral, and in our specimens, by the presence of very distinct lateral stripes, large black spot at base of caudal and in having the ventrals dusky only at tip. *Xenichthys agassizii* has a broad black outer margin to the ventrals.

Xenichthys agassizii STEINDACHNER.

Sitzb. Ak. Wiss. Wien, 1875, **72**, p. 34. (Beiträge, 3, p. 6.) SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 376.

Five specimens, Nos. 3266–70, $6\frac{1}{2}$ to 8 inches long, and one specimen (without tin tag) $4\frac{3}{4}$ inches long from Wreck Bay, Chatham Island. Nos. 3269–70, M. C. Z. 29644, 29647 (2 specimens).

Caesio tile Cuvier & Valenciennes.

Hist. Nat. Poiss., 1830, **6**, p. 322 (428). Günther, Fische der Südsee, 1874, **2**, p. 34.

Six specimens $5\frac{1}{16}$ to $5\frac{13}{16}$ inches long from Manga Reva, coral. M. C. Z. 29411 (3 specimens).

The following life color note was found with the specimens: — "Lower parts bright red, fading to silvery; upper, greenish blue, becoming purple in formalin."

Opercle and subopercle are scaly; in other respects our specimens agree with Steindachner's description of *C. multiradiatus* (Verh. Zool. Bot. Gesellsch. Wien, 1861, **11**, p. 175, fig. 1). Günther, (*loc. cit.*) places *C. multiradiatus* in synonymy of *C. tile*, giving the range of soft dorsal rays as 17–21; while our specimens do not show the same range (being 20–22), we assume that Günther had more material and therefore accept his identification.

HAEMULIDAE.

Haemulon sexfasciatum Gill.

Proc. Acad. Nat. Sci. Phil., 1862, p. 254. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1294.

Eight specimens from Acapulco, one, No. 3366, $7\frac{7}{8}$ inches long and seven, $3\frac{1}{4}$ to $4\frac{1}{2}$ inches long.

A $4\frac{1}{2}$ inch specimen has the head 2.80 in length without caudal; depth 2.63; eye 3.40 in head; snout 3.09; maxillary 2.61, reaches about half way between margin and pupil of eye; dorsal XI–I, 17; anal III, $10\frac{1}{2}$, 2nd anal spine reaches somewhat beyond the tip of the third; scales 10–51–14, counted perpendicularly from lateral line to origin of dorsal 7, counted obliquely 10, from origin of anal vertically up to lateral line 12, obliquely upward and forward 14, the series above lateral line counted longitudinally.

A $3\frac{1}{4}$ inch specimen has head 2.82 in length; depth 2.76; eye 2.87 in head; snout 3.28; maxillary 2.77; dorsal XI–I, 16; anal III, $10\frac{1}{2}$; scales 10–51–14, counted as above.

Another specimen has dorsal XI–I, 17; anal III, $9\frac{1}{2}$; 2nd anal spine longer than 3rd; maxillary reaches beyond front of eye.

A 4th specimen has dorsal XI–I, 17; anal III, $10\frac{1}{2}$; maxillary reaches to front of pupil.

A 5th has dorsal XI–I, $16\frac{1}{2}$; anal III, $9\frac{1}{2}$; maxillary reaches nearly to front of pupil; 2nd anal spine longer than 3rd.

A 6th has dorsal XI–I, 17; anal III, $10\frac{1}{2}$; 2nd anal spine longer than 3rd; maxillary reaches front of pupil.

A 7th has dorsal XI–I, $16\frac{1}{2}$; anal III, $10\frac{1}{2}$; 2nd anal spine longer than 3rd; maxillary reaches front of pupil.

Two specimens $2\frac{1}{2}$ to $2\frac{3}{8}$ inches long from Acapulco. A black stripe extending from tip of snout through eye and along axis of body, terminates in a large black spot along caudal peduncle and base of caudal fin; below the base of caudal fin the cross-bars extend a short distance; a second black stripe from its junction with a similar stripe on the nostril in front of the eye, extends along the side of back to middle of soft dorsal joining its fellow at end of fin and continuing as a single stripe along top of caudal peduncle.

One specimen $2\frac{1}{2}$ inches long from Acapulco. M. C. Z. 29452 (3 specimens).

Haemulon scudderi Gill.

Proc. Acad. Nat. Sci. Phil., 1862, p. 253. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 104.

One specimen, No. 3314, 9 inches long from Acapulco.

Three specimens $3\frac{3}{8}$ to 7 inches long from Perico Island, Panama Bay. M. C. Z. 29563 (2 specimens).

Haemulon steindachneri (Jordan & Gilbert).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1301.
Diabasis steindachneri Jordan & Gilbert, Bull. U. S. Fish. Comm., 1882, **1**, p. 322.

Nine specimens from Acapulco, No. 3367, M. C. Z. 29662, $6\frac{3}{4}$ inches long; No. 3315, $7\frac{3}{4}$ inches long and the remaining seven, M. C. Z. 29565, (untagged) $3\frac{1}{4}$ to $5\frac{1}{4}$ inches long. Four specimens $4\frac{1}{2}$ to $5\frac{5}{8}$ inches long from Perico Island, Panama Bay.

Lythrulon flaviguttatum (Gill).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 459.
Haemulon flaviguttatus Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 254.

Five specimens (young) $2\frac{1}{4}$ to $2\frac{3}{4}$ inches long from Acapulco. M. C. Z. 29434 (1 specimen).

One specimen $3\frac{3}{4}$ inches long from Perico Island, Panama Bay.

Orthostoechus maculicauda Gill.

Proc. Acad. Nat. Sci. Phil., 1862, p. 255. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 106.

Two specimens, Nos. 3364–5, $8\frac{1}{4}$ and $9\frac{1}{8}$ inches long, and seventeen specimens 2 to $6\frac{1}{2}$ inches long, all from Acapulco. M. C. Z. 29406 (1 specimen), 29454 (1 specimen), No. 3364, M. C. Z. 29641 (1 specimen).

In the longest specimen dorsal XIII, $15\frac{1}{2}$; anal III, $9\frac{1}{2}$; caudal blotch more elongate than in our other specimens.

2nd specimen, dorsal XIII, $16\frac{1}{2}$; anal III, $10\frac{1}{2}$.

3rd specimen, dorsal XIII, $16\frac{1}{2}$; anal III, 11.

4th specimen, dorsal XIII, $16\frac{1}{2}$; anal III, $10\frac{1}{2}$.

5th specimen, dorsal XIII, $14\frac{1}{2}$; anal III, $10\frac{1}{2}$.

Anisotremus interruptus GILL.

Proc. Acad. Nat. Sci. Phil., 1861, p. 266. SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 377.

A specimen, No. 3338, $15\frac{3}{8}$ inches long from Acapulco.

Head 3.04 in length without caudal; depth 2.32; eye 4.44 in head; preorbital at narrowest place 5.28 in eye; scales from origin of dorsal downward and backward to lateral line 8, counting one in the lateral line; from lateral line downward and backward to anal 13; in lateral line 52; dorsal X, I, $17\frac{1}{2}$; anal III, 9; pectoral 3.09 in length, extending to a line from base of 7th dorsal ray. Scales above lateral line forward are no larger than they are below.

Anisotremus caesius (JORDAN & GILBERT).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1316.
Pomadasys cacsius JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, **4**, p. 383.

Two specimens, Nos. 3378–9, $7\frac{3}{8}$ and $7\frac{3}{4}$ inches long from Acapulco. Gilbert and Starks (Mem. Cal. Acad. Sci., 1904, **4**, p. 107) state that the maxillary, in their specimens, reaches the middle of eye, instead of not quite to front of eye. In our specimens it just about reaches the front of eye.

Anisotremus surinamensis (BLOCH).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1318.
Lutjanus surinamensis BLOCH, Ausl. Fische, 1791, **5**, p. 3, Atlas, pl. 253.

A specimen, No. 3215, M. C. Z. 29671, $12\frac{1}{4}$ inches long from Wreck Bay, Chatham Island.

Head 2.97 in length without caudal; depth 2.23; eye 4.66 in head; preorbital at narrowest place 5.60; scales from origin of dorsal downward and backward to lateral line 9, in a perpendicular series 7; from lateral line downward and backward to anal 13; in lateral line 52; dorsal XII, I, 16; anal III, 9; pectoral 3.21 in length, reaches a line from base of 13th dorsal spine; scales a little larger anteriorly above lateral line, than they are below. The pectoral in this species is not so long as in *A. interruptus* and the eye is smaller.

Another specimen No. 3216, $13\frac{1}{2}$ inches long from Wreck Bay, Chatham Island.

Head 3.09 in length without caudal; depth 2.39; eye 4.84 in head; preorbital at narrowest place 5.41; scales from origin of dorsal downward and backward to lateral line 9 counting one in lateral line; in a perpendicular series $6\frac{1}{2}$; from lateral line downward and backward to anal 13; in lateral line 52; dorsal XI, I, 16; anal III, 9; pectoral 3.27 in length reaches a line from base of 12th dorsal spine.

Three young examples $2\frac{3}{4}$ to $3\frac{1}{4}$ inches long from Acapulco.

Orthopristis chalceus (GÜNTHER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1338.
Pristipoma chalceum GÜNTHER, Proc. Zool. Soc. London, 1864, p. 146.

One specimen, No. 3111, M. C. Z. 29625, $9\frac{3}{4}$ inches long from Perico Island.

One specimen, No. 3112, 9 inches long from Panama.

Gnathodentex aureolineatus (LACÉPÈDE).

JORDAN & SEALE, Bull. U. S. Bur. Fish., 1906, **25**, p. 269.
Sparus aurolineatus LACÉPÈDE, Hist. Nat. Poiss., 1802, **4**, p. 132.

Seven specimens, 4 to $6\frac{3}{4}$ inches long from Manga Reva.

Five specimens $6\frac{3}{4}$ to $8\frac{3}{8}$ inches long, Nos. 3300–4, M. C. Z. 29704, 29705, from Manga Reva.

SPARIDAE.

Lethrinus rostratus KUHL & VAN HASSLET.

CUV. & VAL. Hist. Nat. Poiss., 1830, **6**, p. 220 (296). GÜNTHER, Cat., 1859, **1**, p. 454.

One specimen, No. 3312, 24 inches long, from Rikitea, Manga Reva.

It has the following measurements: — head 2.78 in length; depth 3.14; eye 7.11 in head; snout 1.65; preorbital, measured from eye to corner of mouth 2.80; pectoral equals ventral and is 1.81 in head; dorsal X, $9\frac{1}{2}$; anal III, $8\frac{1}{2}$; caudal deeply forked; scales 7–50–16.

The specimen shows no distinct black blotch above the pectoral fin; color of the body is pale yellowish, with brown margins to the scales which vary in width in different parts giving the specimen an irregularly barred or coarsely mottled appearance; head plain brown; fins plain.

GERRIDAE.

Eucinostomus californiensis (GILL).

JORDAN, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 469. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 113.
Diapterus californiensis GILL, Proc. Acad. Nat. Sci. Phil., 1862, p. 245.

A specimen, No. 3261, $7\frac{3}{4}$ inches long from Wreck Bay, Chatham Island.

Pectoral reaches beyond vent.

Four specimens, M. C. Z. 29566, $3\frac{1}{2}$ to $4\frac{1}{4}$ inches long from Perico Island.

Twelve specimens, $1\frac{1}{4}$ to $4\frac{1}{8}$ inches long from Naos Island, Panama Bay, on sandy beach in seine.

Fourteen specimens, $\frac{7}{8}$ to $4\frac{1}{4}$ inches long, from Acapulco. M. C. Z. 29425. February 28, 1905.

Xystaema cinereum (Walbaum).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1372.
Mugil cinereus Walbaum, Artedi Piscium, 1792, p. 228.

A specimen, No. 3368, $13\frac{1}{2}$ inches long from Acapulco.

Gerres peruvianus Cuvier & Valenciennes.

Hist. Nat. Poiss., 1830, **6**, p. 467. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 115.

A specimen, No. 3135, $9\frac{3}{4}$ inches long from Panama.

The second dorsal and second anal spines are broken. There is an indication of a black margin to the spinous dorsal; dorsal X, 9.

KYPHOSIDAE.

Doydixodon freminvillei Valenciennes.

Voy. Venus, 1855, **5**, p. 323, pl. 5. Starks, Proc. U. S. Nat. Mus., 1906, **30**, p. 792, pl. 66, fig. 1.

One specimen, No. 3207, $18\frac{5}{8}$ inches long, probably from Wreck Bay, Chatham Island.

Head 3.29 in length without caudal; depth 2.26; eye 6.5 in head; interorbital 2.16; dorsal XII, $19\frac{1}{2}$; anal III, 12. Valenciennes (*loc. cit.*) in his figure shows only 12 anal rays, but in the description says there are 15. The scales 9, counted downward and forward from front of soft dorsal to and including lateral line, downward and backward 9, from lateral line down and back to front of anal 16, down and forward 15, in longitudinal series 51; opercular membranes and base of pectoral are black; a wavy vertical line of darker color than scale across each scale. Spines of dorsal and anal heteracanthous.

Thirty-seven specimens of young $\frac{11}{16}$ to $1\frac{3}{16}$ inches long from Chatham Island shore, January 9, 1905. M. C. Z. 29544 (12 specimens).

Kyphosus elegans (Peters).

Evermann & Jenkins, Proc. U. S. Nat. Mus., 1891, **14**, p. 155. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1387. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 116.
Pimelepterus elegans Peters, Monatsb. K. Akad. Wiss. Berlin, 1869, p. 707.

Two specimens, Nos. 3350–51, $9\frac{1}{4}$ and $11\frac{1}{8}$ inches long from Acapulco. No. 3350, M. C. Z. 29640 (1 specimen).

Three specimens, Nos. 3148–49–50, $9\frac{1}{4}$, $8\frac{3}{4}$ and $10\frac{1}{8}$ inches long from Toboguilla Island, Panama Bay. M. C. Z. 29617 (1 specimen).

The specimens from Acapulco differ somewhat from those from Toboguilla Island, which are here provisionally identified with those from Acapulco. The Acapulco specimens from geographical considerations should be most like typical *K. elegans*, which came from Mazatlan, but they differ from the description given by Jordan and Evermann (*loc. cit.*), in having 12 anal rays instead of 11, larger eye, longer snout and maxillary, and somewhat longer pectoral; and also in having 13 dorsal rays instead of 12.

Gilbert and Starks (*loc. cit.*), in their remarks on specimens they have identified as *K. elegans*, call attention to this difference in the fin rays. The Acapulco specimens differ also from those from Toboguilla in having a somewhat shorter head, smaller eye, slightly shorter maxillary, and a longer anal base. In the Toboguilla specimens the snout is somewhat more vertical, the forehead is a little more prominent and the throat somewhat concave in outline, which in the Acapulco specimens is nearly in line with the ventral curve.

Proportional measurements of two specimens from Acapulco.

Total length in inches	$9\frac{1}{4}$	$11\frac{1}{8}$
Head	3.70	3.66
Depth	1.97	2.02
Eye	3.57	3.64
Snout	3.12	2.81
Maxillary	3.12	2.95
Pectoral	1.42	1.44
Base of anal	1.19	1.21
Scales	10–66–16	9–68–16
Dorsal	XI, 13	XI, 13
Anal	III, 12	III, 12

Proportional measurements of three specimens from Toboguilla.

Total length in inches	$9\frac{1}{4}$	$8\frac{3}{4}$	$10\frac{1}{8}$
Head	3.55	3.43	3.38
Depth	2.08	2.03	2.03
Eye	3.40	3.40	3.53
Snout	2.83	3.	2.86
Maxillary	2.91	3.	2.86
Pectoral	1.41	1.46	1.50
Base of anal	1.24	1.24	1.39
Scales	9–68–16	9–68–16	9–68–16
Dorsal	XI, 13	X, 13	XI, 13
Anal	III, 12	III, 2	III, 12

We also have another specimen $6\frac{1}{2}$ inches long from Toboguilla Island October 28, 1904.

Kyphosus cinerascens (FORSKÅL).

Sciaena cinerascens FORSKÅL, Descript. Anim., 1775, p. 53.

Two specimens, Nos. 3182 and 3183, M. C. Z. 29643, $19\frac{1}{4}$ and 13 inches long from Cook Bay, Easter Island.

No. 3183 has head 3.93 in length; depth 2.45; eye 4.54 in head; snout 2.70; maxillary 2.94; pectoral 1.31; longest anal ray 1.75, in base of fin 1.14; base of anal fin 1.38 in head; middle ray caudal fin 4; upper caudal lobe nearly equal to head, 4.01 in length of body; dorsal XI, 12; anal III, 11; scales 9–76+–16 (19). The scales counted from anal upward and backward to lateral line are in sixteen rows, counted upward and forward are in nineteen rows; in the above formula they were counted vertically from lateral line to front of soft dorsal; most of incisor teeth are rounded at ends with conspicuous roots; the spines of dorsal and anal are heteracanthous. Scales on cheek in eleven rows.

No. 3182 has head 3.84 in length; depth 2.19; eye 4.06 in head; snout 2.96; maxillary 3.25; pectoral 1.30; longest anal ray 1.73, in base of fin 1.16; base of anal 1.38 in head; middle ray of caudal 3.09; upper caudal lobe 3.38; dorsal XI, 12; anal III, 11; scales counted as above 10–78–17 (20); teeth and spines as in No. 3183; scales on cheek in eleven rows. Of the two specimens the larger resembles more closely the figure in Ruppell's Neue Wirbelthiere, but it has a somewhat longer maxillary; the snout is longer than in the smaller specimen and not so steep; it is slightly concave below the gibbosity, while in the smaller it is evenly convex.

Girella nebulosa, sp. nov.

Plate 3, fig. 2, Plate 4, figs. 1, 2.

Type No. 65511, U. S. N. M. (Field no. 3179), a specimen 11.37 inches long from Cook Bay, Easter Island.

Head 3.85 in length; depth 2.04; eye 3.81 in head; snout 2.34; interorbital 2.54; length of pectoral 0.93; ventral 1.05; thirteenth dorsal spine longest, 2.17; height of soft dorsal 1.84; length of ventral 1.08; dorsal XVI, 12; anal III, 10; scales 16–85–25, 11 or 12 scales in transverse series counting downwards and backwards from origin of dorsal to lateral line and about 25 downward and backward from lateral line to front of anal; the transverse row of scales counted to base of caudal; scales of body finely ctenoid; about seven rows of cycloid scales on cheek; a narrow band of about three rows of scales connecting

the scales on nape with those on cheeks; upper edge of opercle scaly, rest of head naked; membranes of all the fins scaly nearly to their margins; caudal fin emarginate; upper lobe slightly longer. Teeth broad, incisor-like, those on sides somewhat narrower and indistinctly trilobate; in front of the main series and close to them are supernumerary teeth, these not in a continuous series, but lying in front of every second or third tooth of the main series and are considerably shorter than those in main series.

M. C. Z. 29450 (2 specimens), 29547 (6 specimens).

Color in alcohol: — general color brownish gray, clouded with dark brown; top of head dark brown, grayish below; a dark band across chin; fins dark brown, pectoral and ventral faintly clouded with darker.

A cotype 4.25 inches long from Easter Island, shore, has head 3.66 in length without caudal; depth 2.57; eye 3.42 in head; snout 2.82; interorbital 2.82; dorsal XVI, 12; anal III, 10; scales 16–85–25.

General color brownish gray, head darker, coarsely clouded with dark brown; mottlings tending to form cross-bars, those on middle of body more distinct; pectoral gray with dusky rays, the other fins dark brown; the dorsals show faint traces of spots; dusky bar across chin; another fainter across throat; some faint mottlings on breast.

Teeth of lower jaw in front, incisor-like, only faintly showing notches, those on sides of lower jaw and all on upper distinctly trilobate; the teeth on each jaw in a single series.

Another cotype, No. 3180, M. C. Z. 29658, 9.37 inches long from Cook Bay, Easter Island, has head 4 in length; depth 2.30; eye 3.84 in head; snout 2.50; interorbital 2.77; dorsal XV, 13; anal III, 10; scales 16–89–25.

General color same as in 4.25 inch specimen; mottled everywhere with brown, but there are no traces of cross-bars.

Movable teeth in a single series, mostly trenchant, some, however, showing traces of three lobes.

Twenty-six specimens .75 to 1.5 inches long from La Perouse Bay, Easter Island, December 17, 1904, shore.

Of these three have dorsal XV, 12; one has dorsal XV, 13; 5 have dorsal XVI, 11; 14 have dorsal XVI, 12 and 3 have dorsal XVI, 13; the anal is constantly III, 10.

The 1.5 inch specimen has head 3.20 in length; depth 3.20; eye 3.33 in head; snout 3.33; interorbital 4; dorsal XVI, 11; anal III, 10. Two specimens $2\frac{3}{4}$ and $3\frac{7}{16}$ inches long from the same place.

Six specimens $\frac{3}{4}$ to $1\frac{3}{8}$ inches long from shore of Easter Island, December 20, 1904.

General color, iridescent gray with nine purplish brown cross-bands, wider above, tapering toward ventral surface, these about .5 diameter of eye at top; interspaces thickly spotted with brown, many of these coalescing into irregular shaped areas; two longitudinal rows of comparatively large spots on interspinous membranes of dorsal, the first through middle of fin, the second near base; three or four rows of smaller spots on basal half of soft dorsal and anal; a few small faint spots on basal portion of caudal; pectoral pale; ventral dusky; outer margin of vertical fins dusky; teeth trilobate.

The stomach is gizzard-like, peritoneum black, underlaid with silvery; owing to the bad condition of the viscera the pyloric coeca are difficult to count but there are probably not over twenty; air bladder divided into two horns posteriorly; in one of the specimens examined the stomach and intestines were filled largely with a calcareous Alga (Corallina); a few diatoms, other algae and small gastropods were also present. These specimens apparently differ from current descriptions of Girella and Tephraeops in lacking an inner band of smaller teeth on jaws and in having in the largest specimen (type) a number of smaller supernumerary teeth outside of and closely attached to the regular series.

MULLIDAE.

Upeneus xanthogrammus Gilbert.

Proc. U. S. Nat. Mus., 1892, **14**, p. 553. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 860.

One example, No. 3321, $8\frac{7}{8}$ inches long from Acapulco.

Pseudupeneus multifasciatus (Quoy & Gaimard).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 256, pl. 22.
Mullus multifasciatus Quoy & Gaimard, Voy. Uranie. Zool. 1825, p. 330, pl. 59, fig. 1.

A specimen, No. 3196, $11\frac{1}{4}$ inches long from Cooks Bay, Easter Island.

Dorsal VIII, I, 8; anal I, 6; scales 3–29–6; head 2.95 in length; depth 2.87; eye 5.71 in head; snout including upper lip 1.70, not including upper lip 1.77; maxillary *plus* premaxillary 2.28; width of maxillary 2.12 in its length; origin of barbel to angle of preopercle 1.63 in head; length of barbel 1.70 in head; longest dorsal spine, 3rd, 1.95; longest ray 2.85, last ray 4; longest anal ray, 1st, 2.66, last ray 3.48; caudal lobes rather short, upper slightly longer

1.42 in head; pectoral 1.40; ventral 1.38, inserted slightly in advance of pectoral, the latter reaches slightly farther back than ventral, neither reaches vent.

Color in alcohol: — ground color of the head greenish gray, of the body yellowish; posterior part of cheek dusky; vertical margin of preopercle and around the eye blackish; dusky mottling on posterior of opercle, behind the eye and on top of head; a continuous dusky area from front of spinous dorsal along back to a little beyond last ray of soft dorsal; irregular dusky spots in front of spinous dorsal or with a mottled appearance from nape to pectoral; irregular dusky spots on the scales, from soft dorsal to lateral line, faintly indicating a band; another one below the soft dorsal and still another just posterior to soft dorsal; end of caudal peduncle and caudal fin dusky; an irregular broad, diffuse, dusky area between lateral line and belly, extending from head and disappearing on caudal peduncle, most intense in a line with the above mentioned bands; on each of the four rows of scales, between the lateral line and the lower base of pectoral there is an irregular narrow diffuse longitudinal dusky stripe, most intense on anterior margin of each scale; axil of pectoral blue-black; pectoral pale yellow; ventrals pale yellow, outer rays dusky above; anal with traces of dusky bars; membranes of both dorsals dusky; barbels yellow.

Our specimen agrees most nearly with Günther's description and figure of *Upeneus trifasciatus* (Fische der Südsee, 1874, **3**, p. 59, taf. 44, fig. B).

Mulloides auriflamma (Forskål).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 250, fig. 103.
Mullus auriflamma Forskål, Descript. Anim., 1775, p. 30.

No. 3291, a specimen $11\frac{1}{2}$ inches long from Rikitea, Manga Reva.

Mulloides samoensis Günther.

Fische der Südsee, 1874, **3**, p. 57, pl. 43, fig. B. Jordan & Evermann, Bull. U. S. Fish Comm., 1905, **23**, pt. 1, p. 253.

One specimen, No. 3292, $6\frac{1}{2}$ inches long from Rikitea, Manga Reva.

Muloides rathbuni (Evermann & Jenkins).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1896, pt. 1, p. 857; 1900, pt. 4, pl. 132, fig. 361.
Upeneus rathbuni Evermann & Jenkins, Proc. U. S. Nat. Mus., 1891, **14**, p. 158, pl. 2, fig. 4.

Eighteen specimens $4\frac{1}{4}$ to 8 inches long from Acapulco. M. C. Z. 29443 (8 specimens).

Actual and proportional measurements of largest and smallest specimens.

	Actual measurements	Proportional measurements	Actual measurements	Proportional measurements
Total length in inches	8		4¼	
Standard length	165 mm.		92	
Head	51	3.22	27	3.40
Depth	45	3.66	19	4.84
Eye	14	3.64	7½	3.60
Snout	23	2.21	11	2.45
Maxillary	16	3.18	8	3.37
Interorbital	14	3.64	7	3.85
Barbel	35	1.45	17	1.58
Pectoral	34	1.50	16	1.68
Ventral	23	2.21	17	1.58
1st dorsal spine	29	1.75	15½	1.74
Longest dorsal ray	21	2.42	10	2.70
Longest anal ray	19	2.68	10	2.70
Base of dorsal	19	2.68	10	2.70
Base of anal	14½	3.51	8	3.37
Dorsal	VII–I, 8		VII–I, 8	
Anal	I, 7		I, 6	
Scales above lateral line	2½		2½	
Scales below lateral line	6		6	
Scales in lateral line	40		40	

In our specimens the anal has from 6–7 rays. The statement of size of eye by Jordan and Evermann (*loc. cit.*) is probably a mistake. The figure shows a smaller eye and but VII dorsal spines. We have examined the Type and it has seven spines. All but one of our specimens have seven spines in the first dorsal and that one apparently has but six.

SCIAENIDAE.

Isopisthus remifer Jordan & Gilbert.

Bull. U. S. Fish. Comm., 1882, **1**, p. 320. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 117.

One specimen, No. 3134, 9½ inches long from Panama Bay.

Head 3.23 in length; depth 4.14; eye 4.57 in head; snout 4; maxillary 2.06; pectoral 1.33; dorsal VII–I, 21; anal II, 17; scales 87.

Corvula macrops (Steindachner).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1427.
Corvina macrops Steindachner, Sitzb. Ak. Wiss. Wien, 1875, **72**, p. 52, fig. 2. (Beiträge, 3, p. 24.)

Five specimens, Nos. 3380–4, 5⅞–6¼ inches long from Acapulco. No. 3383, M. C. Z. 29618, No. 3384, M. C. Z. 29706.

Ophioscion perissa (HELLER & SNODGRASS).

Plate 4, fig. 3.

Sciaena perissa HELLER & SNODGRASS, Proc. Wash. Acad. Sci., 1903, **5**, p. 197.

One specimen, No. 3253, $7\frac{1}{4}$ inches long from Wreck Bay, Chatham Island.

Micropogon altipinnis GÜNTHER.

Proc. Zool. Soc. Lond. 1864, p. 149. GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 132.

One specimen $3\frac{1}{4}$ inches long from Panama market.

Dorsal XI–I, 21; anal II, 8.

Polyclemus goodei (GILBERT).

GILBERT & STARKS, Mem. Cal. Acad. Sci., 1904, **4**, p. 135, pl. 20, fig. 40, 40a.
Paralonchurus goodei GILBERT, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1480.

One specimen $2\frac{1}{2}$ inches long from Panama market.

Eques fuscovittatus, sp. nov.

Plate 5, fig. 1.

One specimen, the Type, No. 65494, U. S. N. M., 7.37 inches long from Acapulco.

Length to base of caudal 158 mm.; head 3.16 in length without caudal; depth 2.90; eye 3.84 in head; snout 3.33; maxillary 2.63; interorbital 4.16; dorsal X–I, 37; anal II, 7; scales about 75; gillrakers 3+14.

Color: centres of scales on body and head grayish, their edges brownish, giving the specimen a brownish gray appearance; seven narrow longitudinal dark brown stripes, alternating with interrupted stripes of the same color on body; lowermost entire stripe runs from just below eye to base of last anal ray and extends faintly on lower edge of caudal peduncle; second beginning at lower posterior margin of eye, extending across upper base of pectoral, fading out on caudal peduncle; third beginning at middle of posterior margin of eye and extending to middle of base of caudal; fourth extending from upper margin of eye to base of last ray of dorsal; fifth extending from front of nape to base of fifth soft dorsal ray, thence along base of dorsal; sixth originating on shoulder and following a more or less irregular course to base of seventeenth dorsal ray, thence along base, joining fifth at 25th ray; seventh commencing on front of nape in common with fifth and following an irregular course to base of ninth dorsal ray, thence along base of fin joining sixth; a dark stripe extending along

the ridge of nape; fins dark brown; spinous dorsal with a wide almost white margin; soft dorsal, anal, and caudal with a narrow white margin; ventral and pectoral tipped with white (probably yellow in life).

This species is near the Atlantic species, *E. acuminatus*, but has a longer snout and greater number of scales in lateral line.

POMACENTRIDAE.

Azurina upalama Heller & Snodgrass.

Proc. Wash. Acad. Sci., 1903, **5**, p. 198, pl. 5. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 385.

Seven specimens 4 to $4\frac{5}{8}$ inches long from Chatham Island shore. M. C. Z. 29536 (3 specimens).

Pomacentrus rectifraenum Gill.

Proc. Acad. Nat. Sci. Phil., 1862, p. 148. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 140.

Gilbert and Starks (*loc. cit.*) state that in this species there are constantly 15 soft dorsal rays and 13 anal rays, the last split ray being in each case, reckoned as one. They also state that in Gill's description of the types of *P. rectifraenum*, he assigns to it 16 dorsal rays and 15 anal rays and it is reasonable to suppose that the split ray at the end of each fin was, by him, reckoned as two rays. In our description, we have followed the latter plan.

Four large specimens, $4\frac{3}{4}$ to $5\frac{7}{8}$ inches long from Acapulco.

Nine large specimens, $3\frac{1}{2}$ to $6\frac{1}{4}$ inches long from Toboguilla Island, among rocks in two fathoms of water. M. C. Z. 29448 (2 specimens).

The Acapulco specimens have uniformly 16 dorsal rays and 14 anal rays. Five of the Toboguilla specimens have 16 dorsal rays and four have 15 dorsal rays; six have 14 anal rays and three have 15 anal rays.

The above specimens show the following colors: — General color dark brown, darker on top of head, lighter on breast and belly; margin of upper lip and whole of lower lip pale; the scales of sides of body have dark-margins, forming transverse lines; dorsal, ventral, anal, and caudal blue-black; pectoral with dusky rays, paler membranes forming a dark olive shade, the two upper rays are paler, base of pectoral brown body color with a small black spot at base of 1st ray, a white bar, widest at the top, extending across base of the rays behind, this bar sharply separating the dusky pectoral from its brown base. These specimens show no traces of pearly spots.

Nine specimens $2\frac{3}{8}$ to $3\frac{7}{16}$ inches long from Perico Island, Panama Bay.

Of these, eight have 16 dorsal rays and one has 17 dorsal rays; the anals have uniformly 14 rays.

These specimens show the following colors: — all more or less spotted with pale blue or pearly spots; the three larger ones with no spots on body and fewer and fainter spots on head and fins; some of the smaller specimens similarly marked; the posterior margins of body scales dusky, forming narrow transverse lines; in some of the smaller specimens, in addition to the dusky marks there is a pale blue curved bar on each scale on side of body becoming spots on back and belly and forming alternating transverse lines with the darker margins below lateral line and long lines following rows of scales above lateral line; the spots on the side of the head are irregular in size and arranged approximately in series downward and forward towards the isthmus: two lines formed of these spots under the eye, one just below suborbital following its curve to corner of mouth, one under eye and parallel with its margin on the suborbital, a short line extends from front of eye forward to edge of preorbital; a light blue line on upper part of eye; a line of coalescent spots extending from tip of snout back over eye to front of spinous dorsal, a series of fainter spots between these on the median line, such spots occurring also on soft dorsal and anal and following the row of scales; in the smaller specimens a small black spot on caudal peduncle just back of the angle of soft dorsal; several specimens with a large pearly spot on angle of dorsal and anal; none of these showing traces of black spot or ocellus on anterior base of soft dorsal; a small black spot on upper base of first ray of pectoral. In these specimens the pectoral fins are pale, agreeing with the larger specimens in the markings behind pectoral.

Three specimens $1\frac{7}{8}$ to 2 inches long from Perico Island, Panama Bay. These specimens are like the preceding except that they show traces of the black spot on anterior base of soft dorsal.

Two specimens $2\frac{3}{4}$ to $3\frac{1}{8}$ inches long from Toboguilla Island, Panama Bay, among coral in two fathoms of water.

These have 16 dorsal and 14 anal rays. They are similar in color to the larger specimens but show a few pearly spots on sides of head.

Seven specimens $1\frac{3}{8}$ to $2\frac{11}{16}$ inches long from Acapulco. M. C. Z. 2956S (4 specimens).

Of these, all have 16 dorsal rays; six have 14 anal rays and one has 13 anal rays.

These specimens have the general color of the Perico Island specimens, but the three largest show traces of a black spot on the anterior base of soft dorsal;

the smaller ones show distinct black spots on anterior base, each surrounded by pearly spots giving the appearance of an ocellus.

Pomacentrus gilli GILBERT & STARKS.

Mem. Cal. Acad. Sci., 1904, **4**, p. 141, pl. 22, fig. 44.

Three specimens $2\frac{7}{8}$ to $4\frac{3}{4}$ inches long from Acapulco.

All have dorsal rays 15, one has anal rays 14, and two have them 13.

Five specimens M. C. Z. 29567, $2\frac{7}{8}$ to $4\frac{5}{8}$ inches long from Perico Island. All have dorsal rays 15, and anal 13.

Six specimens $2\frac{1}{2}$ to $3\frac{3}{4}$ inches long from Toboguilla Island, among coral in two fathoms of water. Of these five have dorsal rays 15, and six have anal 13, one has dorsal 16.

One specimen, M. C. Z. 29453, $2\frac{1}{4}$ inches long from Perico Island. This has 15 dorsal rays and anal 13.

The three specimens from Acapulco have general color brown, the posterior edges of scales darker, forming transverse lines on sides of body; faint pale spots on sides of head, none on front of head or nape, both lips pale; no blue line on top of eye; a few pale spots on soft dorsal, anal, and caudal; pectoral very pale and translucent with no distinct spot at base of upper ray, base darker than body color both in front and behind; no distinct white bar on base of pectoral rays behind; in the two larger specimens no trace of spot or ocellus on anterior base of soft dorsal; a large black spot on anterior base of soft dorsal in smallest specimen; in the two larger specimens the posterior margin of soft dorsal and anal paler; in smaller specimen, posterior margins of these fins abruptly pale; a small black spot on upper base of caudal peduncle.

The five specimens from Perico Island are similar in color to the above but slightly paler; the spots on head more distinct; none show pale spots on rays of soft dorsal, anal, or caudal; all have some pale spots on scaly base of anal; the two larger specimens show very slight traces of paler posterior margins to dorsals and anals. On the two next in size this is more distinct and on the smallest it is abruptly paler, none showing traces of spot or ocellus on soft dorsal, or spot on top of caudal peduncle. The largest one shows no white spot on axil of dorsal or anal. The next in size has a spot on base of posterior rays of anal, the others having these in axil of both fins, that of anal extending on to rays.

The six specimens from Toboguilla are similar in color, all but one darker than the preceding; spots on head very distinct; the smallest is pale with distinct spot at base of first pectoral ray; outer margin of vertical fins dusky

with a faint inner pale band; traces of pearly spots on scaled base of anal and on belly and posterior part of body, but none of these spots are present in the larger specimens.

The one specimen from Perico Island is similar in color to the paler forms above described; spots on side of head distinct; no spot on caudal peduncle; fins same color as body; pale spot in axil of dorsal and anal.

Comparative Measurements.

	Pomacentrus rectifraenum	*Pomacentrus gilli.*
Total length	94 mm.	94 mm.
Head	3.13	3.13
Depth	1.77	1.88
Eye	3.33	3.52
Preorbital, between eye and corner of mouth	4.28	5.42
Maxillary	3.33	3.15
Interorbital	2.72	3.15

Gilbert and Starks (*loc. cit.*), state that *P. gilli* is closely related to *P. rectifraenum* but differing constantly in the uniformly translucent pectoral, larger eye, narrower and flatter interorbital space, narrower preorbital, which is serrated to a point opposite to or in advance of the angle of the mouth, and in the shorter dorsal and anal fins.

In the specimens which we have identified as these two species we find that all the above characters do not hold. In many of the smaller specimens of *P. rectifraenum*, the pectorals are translucent; the eye is not constantly larger in *P. gilli*; the interorbital space agrees in being narrower in *P. gilli*, but the difference in flatness in the two can not always be distinguished; while in the larger specimens the preorbital is somewhat narrower in *P. gilli*. This character is hard to distinguish in the small specimens and the preorbital serrations are variable and are of no importance as a means of separating the two species. Out of thirty-four specimens of *P. rectifraenum* we have one specimen in which there are 13 rays in the anal; out of fifteen specimens of *P. gilli* we have one with 16 dorsal rays and one with 14 anal rays. These are probably individual variations and in general would not effect the separation of the species, since this variation does not affect both dorsal and anal in the same specimen. In our specimens, the presence of accessory scales upon the top of head and between eyes in *P. rectifraenum* and their absence in *P. gilli* seems to furnish a distinguishing character, particularly in the larger individuals. Another constant and well-marked character in *P. rectifraenum* is the presence of a very distinct

white bar on the base of the pectoral rays behind, separating the darker fin from the purplish brown pectoral base. In practically all our specimens of *P. rectifraenum* there is a small black spot on the outer base of the first pectoral ray which does not extend on to base of pectoral. On *P. gilli* there is no distinct black spot but a very dusky area extends across the outer base of the pectoral fin.

Pomacentrus arcifrons HELLER & SNODGRASS.

Proc. Wash. Acad. Sci., 1903, **5**, p. 202, pl. 7. SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 389.

Two specimens $2\frac{5}{16}$ to $2\frac{15}{16}$ inches long, Chatham Island, shore.

Proportional measurements of the two specimens.

Head in total length without caudal	3.33	3.42
Depth without caudal	2.30	2.28
Eye in head	3	2.80
Interorbital in head	3.60	3.50
Preorbital in head	7.71	7.00
Dorsal	XII, 16	XII, 16
Anal	II, 15	II, 14

Color in spirits, very dark brown, a little lighter on belly and lower part of head; lips pale; body posteriorly gradually becoming lighter to margin of caudal, which is quite pale; posterior margin of soft dorsal slightly paler than rest of fin; traces of small pearly spots on head; no trace of black spot or ocellus on anterior base of soft dorsal; small white spot on base of two last dorsal rays, a larger one on base of posterior anal rays; small black spot on base of first pectoral ray and a pale bar on pectoral behind axil as in *P. rectifraenum* but not so distinct. The smaller specimen is similarly colored, the pale areas being, however, more marked; an indistinct ocellus is formed on the anterior base of soft dorsal by a circle of small pale spots, the ground color of the ocellus of same intensity as surrounding area.

Thirteen specimens $\frac{5}{8}$ to $1\frac{1}{4}$ inches long, Chatham Island. M. C. Z. 29456 (2 specimens), M. C. Z. 29606 (1 specimen).

The general color of these is same as preceding, but the posterior pale area is almost yellowish white and covers posterior half of soft dorsal. The black ocellus on anterior base of soft dorsal is very distinct.

The large specimens compared in color with specimens of *P. rectifraenum* of same size, show no marked difference. Our specimens of *P. rectifraenum* do not show the paler caudal peduncle and caudal. The specimens of *P. arcifrons*

are a little more slender and the suborbital a little narrower. It is possible that the strong color marking of the very young of *P. arcifrons* may serve to distinguish them from young of *P. rectifraenum*. We have no very young of the latter. In as much as the posterior paler color decreases with age, it is probable that this character would not distinguish larger individuals from *P. rectifraenum*.

Four specimens, Nos. 3217–19, No. 3219, M. C. Z. 29684 and 3271, M. C. Z. 29,642, 6 to $6\frac{3}{5}$ inches long from Wreck Bay, Chatham Island.

Pomacentrus flavilatus GILL.

Proc. Acad. Nat. Sci. Phil., 1862, p. 148.

Ten specimens $1\frac{5}{16}$ to $2\frac{13}{16}$ inches long from Acapulco. M. C. Z. 29540 (5 specimens).

One specimen, $1\frac{5}{8}$ inches long from Perico Island, Panama Bay.

Proportional Measurements of four of the largest Acapulco specimens.

Total length	56 mm.	51	49	48
Head in length without caudal	3.11	3	3.06	3.20
Depth	2.15	1.96	2.13	2.08
Eye in head	3.	2.83	2.90	2.72
Preorbital in head	7.2	8.50	9.14	7.50
Interorbital in head	3.6	3.77	4.	3.75
Dorsal counting last	XII, 15	XII, 15	XII, 15	XII, 15
Anal	II, 13	II, 13	II, 13	II, 14

In the remaining specimens the dorsal rays are constantly 15, and the anal rays 13, except in one which has 14.

The following color note was found with the specimen: — "Back brilliant blue, lower parts chrome; dorsal ocellus black."

Color in spirits, top and sides of head to near lower edge of eye and extending backward slightly below lateral line to under 6th or 7th dorsal ray abruptly purplish brown; below this, sides of head and body yellow, posteriorly brighter. The better preserved specimens have centres of scales, on sides of body on the purplish area and some on the head pale blue; posterior margin of scales dusky, forming narrow transverse lines becoming fainter posteriorly and ventrally; a jet black spot, sometimes ocellated, on upper surface of caudal peduncle; small blue spots on scales of the dusky spinous dorsal; a trace of an inframarginal pale band also present on spinous dorsal; soft dorsal dusky, with a white area, varying in size, on its posterior base, a large jet black-blue margined spot on

anterior base of fin; in some specimens there are from one to three dusky spots near the base of the rays on the white area of the soft dorsal, there is a pale blue centre in some of these spots; pectoral pale and translucent with a small black spot on base of upper ray; ventral dark gray or slate; anal usually creamy white with a broad dusky anterior and lower margin, the posterior rays with dusky tips. Some specimens have dusky punctulations and numerous dusky spots on scales of anal, some of the spots have pale blue centres. Other specimens have larger spots posteriorly, similar to those on white area of soft dorsal; in some there are similar spots, varying in number and extent, on caudal peduncle and caudal; caudal fin dusky, varying in intensity.

The head in *P. flavilatus* is closer to *P. gilli* than to *P. rectifraenum*, but it is generally longer than in *P. gilli* and in the latter it is longer than in *P. rectifraenum*. The three agree quite closely in depth, *P. flavilatus* averaging a little deeper. In the eye they overlap, but *P. rectifraenum* averages a larger eye than *P. flavilatus* and it in turn averages larger than *P. gilli*. The preorbital in *P. flavilatus* is close to *P. gilli*, but is slightly narrower; in *P. rectifraenum* it is considerably wider. The interorbital of *P. flavilatus* and *P. gilli* averages about the same; in *P. rectifraenum* it is considerably wider.

Except the great differences in coloration, there seem to be no characters by which we can distinguish *P. flavilatus* from the young of *P. gilli*. Our specimens of *P. gilli*, however, show a more vertical posterior margin to the preopercle, which in *P. flavilatus* is strongly inclined forward; *P. rectifraenum* is quite distinct.

Pomacentrus jenkinsi Jordan & Evermann.

Bull. U. S. Fish Comm., 1903, **22**, p. 189; 1905, **23**, pt. 1, p. 270, fig. 115.

Twenty-one specimens $\frac{5}{8}$ to 5 inches long from La Perouse Bay, Easter Island. M. C. Z. 29571 (9 specimens).

Three specimens, Nos. 3185–7, No. 3187, M. C. Z. 29685, $5\frac{3}{4}$ to 6 inches long from Cook Bay, Easter Island.

Thirty-six specimens $1\frac{1}{16}$ to 6 inches long, Easter Island, shore. M. C. Z. 29442 (9 specimens).

In counting the soft dorsal of the above specimens, we have counted the last ray divided to the base as two rays. It is evident that previous authors have counted as half or part of a ray what we now count as a ray. Out of thirty specimens counted from Easter Island, one had 16 dorsal rays, seventeen had 17 rays, eleven had 18 rays, and one had 19; the anal was uniformly 14; in the descriptions the dorsal has 16 and anal 13; specimens from Hawaii in

the Jordan and Evermann collection, seven specimens have dorsal 17, anal 14 as we count them.

The very young have a small white margin on spinous dorsal, becoming progressively but variously narrower in specimens up to three inches long, after which it seems to disappear entirely. This margin is not so evident in the Hawaiian specimens of similar size. This may be due to their faded condition.

Pomacentrus leucorus GILBERT.

Proc. U. S. Nat. Mus. 1892, **14**, p. 554. SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 387.

Six specimens 4 to 6 inches long, Nos. 3220–5, from Wreck Bay, Chatham Island. No. 3224, M. C. Z. 29635, No. 3225, M. C. Z. 29701.

Four specimens, M. C. Z. 29549, 1 to $1\frac{7}{8}$ inches long from Chatham Island, shore.

The following color markings were noted. A specimen 25 mm. long had side of head, body, and belly dark brown fading to pale dusky on dorsal surface anterior to soft dorsal, becoming darker again on top of snout; posterior part of caudal peduncle lighter; a line of pearly spots from tip of snout backward across upper surface of eye to nape, other small pearly spots in front of and below orbit and on opercle; base of spinous dorsal very pale, spines pale, membrane dusky, a large black ocellus on last two dorsal spines and first two rays and extending on body nearly to lateral line, rest of soft dorsal, caudal, and pectoral slightly dusky; anal and ventral color of body, traces of lighter spots on posterior base of soft dorsal and anal; outer ray of ventrals with an interrupted pearly line; trace of a light spot near tip of pectoral.

A specimen 46 mm. long similar to preceding, dorsal surface much darker with traces of grayish, tips of membranes of spinous dorsal black, ocellus confined to soft dorsal and body; pearly line from tip of snout to eye distinct, the remainder of line and other pearly spots not so marked; spot near tip of pectoral more distinct than in smaller specimens.

Abudefduf sordidus (FORSKÅL).

JORDAN & EVERMANN, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 274, fig. 117.
Chaetodon sordidus FORSKÅL, Descript. Anim., 1775, p. 62 .

Two specimens $3\frac{3}{8}$ and $3\frac{9}{16}$ inches long, from Manga Reva.

In the larger specimen the black saddle on caudal peduncle is very indistinct, and the dorsal, caudal, and anal have very dusky edges, differing in this respect from the smaller one and the young.

Twenty-one specimens $\frac{3}{4}$ to $1\frac{7}{16}$ inches long from Manga Reva.

In these specimens the 2nd and 3rd body bands fuse on the spinous dorsal, in a distinct black area or blotch.

The following color note was found with these specimens: — "Broad bars, light slate gray, light silver; dorsal and peduncle spots black; spinous dorsal canary behind spot."

Six specimens $5\frac{1}{4}$ to $7\frac{3}{16}$ inches long, No. 3282–85, No. 3285, M. C. Z. 29694–95 (two damaged and not tagged), from Rikitea, Manga Reva.

Abudefduf semptemfasciatus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 285.
Glyphisodon septemfasciatus Cuv. & Val., Hist. Nat. Poiss. 1830, **5**, p. 346 (463).

Two specimens $5\frac{1}{2}$ and 7 inches long, 3286–7, M. C. Z. 29645, 29634 from Rikitea, Manga Reva.

These specimens, which we provisionally identify as above, closely resemble our specimens of *A. declivifrons*, but have a somewhat narrower preorbital, a wider interorbital, and more dorsal and anal rays. They differ also in having paler fins; in *A. declivifrons* the soft dorsal, anal, and caudal are almost black while in *A. septemfasciatus* these fins are much paler with the tips of the dorsal lobes dusky and a broad sharply defined caudal terminal margin, widest at the end of the lobes. They do not agree in form with Bleeker's figure (Atlas **9**, tab. 409, Pomac. tab. 10, fig. 5) of this species. Compared with a specimen $7\frac{3}{8}$ inches long from Samoa identified by Jordan and Seale as *A. septemfasciatus*, their specimen has a steeper profile and much darker coloration, and the ventrals, dorsal, anal, and caudal are blue-black, the caudal showing a trace of darker margin; pectoral pale; this specimen also shows purplish brown streaks along the rows of scales on the breast, not evident in our largest specimen, and but faintly indicated in the smaller; these streaks are not of specific value, because they are present in some specimens of *A. declivifrons* and absent in others.

In the 7 inch specimen the head is 3.25 in length; depth 1.63; eye 3.81 in head; preorbital 6.46; interorbital 2.47; dorsal XIII, 14 (13); anal II, 13 (12).

In the $5\frac{1}{2}$ inch specimen the head is 3.18 in length; depth 1.66; eye 3.47 in head; preorbital 6.60; interorbital 2.07; dorsal XIII, 14 (13); anal II, 14 (13).

Abudefduf saxatilis (Linné).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 475.
Chaetodon saxatilis Linné, Syst. Nat. ed. 10, 1758, p. 276.

Twenty-four specimens, $\frac{7}{8}$ to $4\frac{5}{16}$ inches long from Chatham Island, shore.

Nine specimens, Nos. 3226, 3262, 3263, M. C. Z. 29672, and 3272–77, 5 to 7 inches long from Wreck Bay, Chatham Island. No. 3262, M. C. Z. 29637, No. 3272, M. C. Z. 29691, No. 3274, M. C. Z. 29668, No. 3275, M. C. Z. 29682, No. 3276, M. C. Z. 29629, No. 3277, M. C. Z. 29688.

Twenty-nine specimens, $1\frac{1}{4}$ to $4\frac{3}{5}$ inches long among coral in two fathoms of water and one specimen, No. 3133, $7\frac{1}{8}$ inches long, all from Toboguilla Island, Panama Bay.

Thirty-two specimens, 1 to $4\frac{1}{4}$ inches long from Perico Island, Panama Bay, in tidal pools and among coral in two fathoms of water.

Twenty-one specimens, $2\frac{1}{8}$ to $4\frac{1}{4}$ inches long, and two specimens, Nos. 3369–70, $4\frac{3}{4}$ and 7 inches long, all from Acapulco.

Abudefduf declivifrons (Gill).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 476.
Euschistodus declivifrons Gill, Proc. Acad. Nat. Sci., Phil., 1862, p. 146.

Two specimens $2\frac{1}{2}$ to $3\frac{7}{8}$ inches long from Toboguilla Island, Panama Bay, among coral in two fathoms of water. M. C. Z. 29562 (1 specimen).

Seventeen specimens $\frac{3}{4}$ to $1\frac{1}{4}$ inches long, Perico Island, October 26, 1904, in pool.

Three specimens $4\frac{1}{2}$ to $6\frac{1}{4}$ inches long, Nos. 3371–3, Acapulco, February 28, 1905. No. 3373, M. C. Z. 29632 (1 specimen).

The $6\frac{1}{4}$ inch specimen had head 3.02 in length; depth 1.65; eye 3.72 in head; suborbital 5.85; interorbital 2.73; dorsal XIII, 13 (12); anal II, 11 (10). In another specimen the dorsal was XIII, 13 (12); anal II, 12 (11); another had dorsal XIII, 14 (13); anal II, 11 (10).

The young are easily distinguished from the young of *A. saxatalis* by the direction of two of the bands; in *A. saxatalis* the band from about the middle of the spinous dorsal runs downward and slightly forward to the belly, somewhat in front of anal; and the band from posterior part of spinous dorsal extends downward and forward, nearly parallel with other toward front of anal. In *A. declivifrons* the band from spinous dorsal extends downward and backward to front of anal. The band from the posterior part of spinous dorsal extends downward and backward to about the middle of anal; each band is of about uniform width; in *A. declivifrons* they are broader dorsally, becoming narrower ventrally, making them appear divergent. In *A. declivifrons* the bands above the lateral line are much darker, making the pale interspaces appear more distinct (spot-like).

Abudefduf glaucus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 286.
Glyphisodon glaucus Cuv. & Val., Hist. Nat. Poiss., 1830, **5**, p. 355 (475).

Three specimens 2 to $2\frac{3}{4}$ inches long from Manga Reva, Paumotus Islands, February 3, 1905. M. C. Z. 29416 (1 specimen).

Dascyllus aruanus (Linné).

Günther, Fische der Südsee, 1881, **7**, p. 235 taf. 124, fig. B.
Chaetodon aruanus Linné, Syst. Nat. ed. 10, 1758, p. 275.

Thirty-six specimens $2\frac{1}{4}$ to 3 inches long from Manga Reva, coral. M. C. Z. 29556 (16 specimens).

Chromis caeruleus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 290, pl. 44, fig. 1.
Heliases caeruleus Cuv. & Val., Hist. Nat. Poiss., 1830, **5**, p. 372 (497).

Thirty specimens $2\frac{1}{4}$ to 4 inches long, Manga Reva, coral. M. C. Z. 29402 (5 specimens).

The following color note was found with the specimens: — "Bright green, shading to silver on lower parts, changes to blue at once in preservatives."

One specimen $3\frac{1}{8}$ inches long from Manga Reva, February 1, 1905, coral.

Jordan and Seale included in the synonymy of this species *Chromis lepisurus* Bleeker, and *Heliastes lepidurus* Günther Fische der Südsee. In our specimens the outer rays of the caudal are more produced than shown in the figures of Bleeker and Günther.

Chromis atrilobatus Gill.

Proc. Acad. Nat. Sci. Phil., 1862, p. 149. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 139, pl. 21, fig. 43.

Twenty-two specimens $2\frac{1}{4}$ to 4 inches long, Acapulco. M. C. Z. 29570 (16 specimens).

Twenty-three specimens $2\frac{1}{4}$ to $4\frac{1}{2}$ inches long, Toboguilla Island, among coral in two fathoms of water.

Microspathodon dorsalis (Gill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1568; 1900, pt. 4, pl. 236, fig. 594.
Hypsypops dorsalis Gill, Proc. Acad. Nat. Sci., Phil., 1802, p. 149.

Four specimens, Nos. 3324–3327, $7\frac{3}{4}$ to $10\frac{5}{8}$ inches long, and five specimens $4\frac{3}{4}$ to 6 inches long, all from Acapulco. No. 3324, M. C. Z. 29660, No. 3325, M. C. Z. 29680.

LABRIDAE.

Bodianus diplotaenius (Gill).

Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 391.
Harpe diplotaenia Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 140.

A female $9\frac{1}{2}$ inches long from Toboguilla Island, Panama Bay.

Bodianus eclancheri (Valenciennes).

Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 392.
Cossyphus eclancheri Val., Voy. Venus, 1846, pl. 8, fig. 2, 1855, **5**, p. 340.

No. 3248, a specimen 13 inches long from Wreck Bay, Chatham Island.

The dark markings on the two sides are different and not at all like Valenciennes's description. A great color variation is described by Snodgrass and Heller (*loc. cit.*).

Pseudolabrus inscriptus (Richardson).

Labrichthys inscripta Günther, Cat., 1862, **4**, p. 115.
Labrus inscripta vel *Tautoga inscripta* Richardson, Ichthy. Erebus & Terror, 1844, p. 134, pl. 56, fig. 1–2.

Plate 5, fig. 2, Plate 6, fig. 1.

Four specimens 2 to 5.25 inches long from shore at Easter Island. M. C. Z. 29438 (2 specimens).

Proportional measurements of the two largest specimens.

Total length in inches	5.25	3.94
Length (standard) mm.	115	83
Head in length	3.10	3.19
Depth	3.10	3.19
Eye in head	5.28	4.33
Snout in head	3.08	2.88
Dorsal	IX, $11\frac{1}{2}$	IX, $11\frac{1}{2}$
Anal	III, $10\frac{1}{2}$	III, $10\frac{1}{2}$
Scales	4–26–8	4–26–8
Canines	2 (4)–4	2 (4)–4

Richardson in his description gives dorsal IX, 14, in figure IX, 11.

Color in spirits: — of the two larger specimens the smaller is very much lighter in color, but of similar pattern and possessing small black spots between lateral line and dorsal, these arranged in groups of 1–3, the arrangement unlike on the two sides, but for the most part in pairs; a group of four indistinct spots on top of caudal peduncle; white spots and lines on sides of head and throat are more distinct in the larger specimen. In the two smaller specimens the colors are more faded but similar to the smaller specimen just described.

Halichoeres sellifer GILBERT.

Proc. U. S. Nat. Mus., 1890, **13**, p. 67.

One specimen, No. 3387, $6\frac{1}{4}$ inches long from Acapulco.

This specimen agrees structurally very well with the description of the Type, except that the caudal is subtruncate or gently rounded; when spread the outer rays are regularly shorter than the middle rays. Gilbert and Starks (Mem. Cal. Acad. Sci., 1904, **4**, p. 144) mention specimens from Panama Bay with such caudal.

This specimen had been so long in alcohol that the colors can not be determined definitely.

There is a trace of a black half-bar on the side of the back from between the 5th and 7th dorsal spines, and indications of other dark markings along back extending downward from dorsal, the first from region of 9th spine and 1st ray; 2nd from 3rd and 5th ray; 3rd from 6th and 7th; 4th from 9th and 10th; 5th a sort of saddle on caudal peduncle, the intensity of these is greatest on the lateral line, below the lateral line is a faded area, and below this an irregular dusky shade most intense in line with the bars; traces of three of four narrow, wavy dusky cross-bars on the dark yellow caudal; other fins all plain yellowish with very slight traces of dusky lines. Head 3.28 in length; depth 3.28; eye 6 in head; snout 3.32; dorsal IX, 11; anal III (?), 12; scales $3\frac{1}{2}$–28–$8\frac{1}{2}$.

Halichoeres dispilus (GÜNTHER).

JORDAN, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 481.
Platyglossus dispilus GÜNTHER, Proc. Zool. Soc. London, 1864, p. 25.

Two specimens $3\frac{3}{4}$ and $3\frac{15}{16}$ inches long from Acapulco. M. C. Z. 29538 (1 specimen).

The $3\frac{15}{16}$ inch specimen has head 3.22 in length; depth 4.14; eye 4.50 in head; snout 3.37; scales 4–27–$8\frac{1}{2}$; dorsal IX, 11; anal III, 12; a well-developed canine on each side of upper jaw.

Color note: — an irregular pale margined ocellus occupying part of five scales lies below space between 4th and 5th dorsal spine, the two central scales being in lateral line; middle rays of caudal covered by a large dusky blotch, within this are three small pale spots.

The other specimen can not be distinguished structurally except in the absence of canine teeth in the sides of upper jaw, and slight variation in color. The dark ocellus lies below 4th dorsal spine, and occupies one entire scale and part of two others, one of these lying in lateral line, the others below. No dusky blotch on caudal.

Pseudojulis notospilus Günther.

Proc. Zool. Soc. London, 1864, p. 26. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 396.

Plate 6, fig. 2.

Two specimens 5.37 and 5.62 inches long from Acapulco.

Larger specimen deformed, giving it a much steeper profile. The color differs somewhat from current descriptions. The following color note was with the specimen: — "Ground color, olive-green with darker bars; edge of dorsal, anal, and ventral sky-blue, dots on anal and dorsal of the same color, middle dorsal spot black, submarginal stripe brown, lighter bar sometimes bluish."

One specimen M. C. Z., 29558, 5.5 inches long from Acapulco February 28, 1905.

The following color note was with the specimen: — "Dorsal spot yellow on either side of black middle spot; purple bar at base of pectoral; sky-blue spots forming bars on dorsal, caudal and anal; scales with blue marginal bar; general color olive-green."

Five specimens $\frac{5}{8}$ to $1\frac{3}{4}$ inches long from Perico Island, in tide pool.

We give the following notes on a specimen 3.06 inches long from Acapulco.

No canine teeth in posterior part of jaws, anterior canines $\frac{2}{4}$ (or possibly $\frac{4}{4}$); head scaleless; about six scales (possibly seven) in front of dorsal, not meeting over dorsal ridge; lateral line complete and continuous; scales in lateral line 18+3+6 or 7, in transverse series four including lateral line and counted from front of dorsal downward and backward, $8\frac{1}{2}$ downward and backward from lateral line to origin of anal. Head 3.5 in length; depth 3.63; eye 4.75 in head; snout 3.33; interorbital 5; dorsal IX, 11; anal III, 12.

Cheilio inermis (Forskål).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 314, pl. 33.
Labrus inermis Forskål, Descript. Anim., 1775, p. 34.

Three specimens, Nos. 3166, M. C. Z. 29651, 3167, and 3168, $14\frac{1}{2}$, $15\frac{1}{8}$ and $16\frac{3}{16}$ inches long from Cook Bay, Easter Island.

These specimens vary greatly in color, but little in structure. No. 3168 is a little more slender, has a smaller eye, a slightly larger and slightly longer mouth. No. 3166 has head 3 in length; depth 5.83; orbit 6.41 in head; distance from tip of snout to corner of mouth 2.85 in head; tip of upper lip to orbit 2.22; interorbital 10.3; pectoral 2.61; dorsal rays 22; anal I, 14; scales

6–46–11; No. 3167 has head 3 in length; depth 5.84; orbit 6.38 in head; distance from tip of snout to corner of mouth 2.8; tip of upper lip to orbit 2.25; interorbital 10.4; pectoral 2.8; dorsal rays 22; anal I, 14; scales 6–46–11. No. 3168 has head 3 in length; depth 6.42; orbit 7.17 in head; distance from tip of snout to corner of mouth 2.48; tip of upper lip to orbit 2.17; interorbital 10.1; pectoral 2.71; dorsal rays 22; anal I, 14; scales 6–46–11.

Nos. 3166 and 3167 are essentially alike in color, each having a large irregular black blotch on the side immediately back of tip of pectoral, beginning on a level with opercular angle and extending in No. 3166 to the belly and not quite to it in No. 3167, the spot being fainter below; general color of body and upper part of head, dark purplish brown, each scale margined with yellowish, giving the specimen a cross-hatched appearance; dorsal and anal membranes mottled with white; caudal in No. 3166 brownish olive, in No. 3167 it is mottled like dorsal and anal; No. 3168 is markedly different in color, almost uniformly dull yellowish tending to brownish on back; a longitudinal dark stripe on axis from just below angle of opercle to caudal, the stripe is composed of spots, each occupying most of a scale, anteriorly the spots are in pairs, posteriorly they are single and on the lateral line; all the fins are plain yellowish, no mottling.

Thalassoma duperrey (Quoy & Gaimard).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 302, fig. 130, pl. 35.
Julis duperrey Quoy & Gaimard, Voy. Uranic. Zool., 1824, p. 268, pl. 56, fig. 2.

One specimen 6 inches long from Toboguilla Island.

One specimen, M. C. Z. 29404, $4\frac{1}{4}$ inches long from Acapulco.

The following color note was with the last specimen, M. C. Z. No. 29404: — "Shoulder and front of pectoral canary-yellow; belly and rest of body wine-red; looks blue in water on top; head pinkish black; chin blue; pectoral spot blue-black; darker sublateral band; caudal black; dorsal and anal body color with a light margin."

Thalassoma purpureum (Forskål).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 295.
Scarus purpureum Forskål, Descript. Anim., 1775, p. 27.

One specimen, No. 3169, 16 inches long, probably from Cook Bay, Easter Island.

This specimen is a faded counterpart of *Scarus georgii* (Bennett, Fish. Ceylon, 1834, pl. 24) and resembles very closely Ruppell's figure of *Julis semicoeruleus* (Neue Wirb. Fische, Atlas, 1828, taf. 3, fig. 1).

Thalassoma umbrostigma (Rüppell).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 300, fig. 129.
Julis umbrostigma Rüppell, Neue Wirb. Fische. Atlas, 1828, taf. 3, fig. 2.

Nineteen specimens, M. C. Z. 29407, $\frac{13}{16}$ to $2\frac{3}{8}$ inches long from La Perouse Bay, Easter Island.

Thirty-eight specimens $1\frac{1}{16}$ to $2\frac{1}{2}$ inches long, Easter Island.

Thalassoma lucasanum (Gill).

Jordan, Proc. Cal. Acad., 1895, ser. 2, **5**, p. 482.
Julis lucasanum Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 142.

Four specimens, M. C. Z. 29413, $1\frac{9}{16}$ to $2\frac{3}{8}$ inches long from Acapulco.

Nine specimens $2\frac{7}{8}$ to $4\frac{3}{4}$ inches long from Toboguilla Island, Panama Bay, coral.

The Acapulco specimens have the following color note with them: — "Body silvery; breast and lower head yellow, continued as a sublateral band to caudal fin; below this red; caudal also red, except black and white marginal stripes; ventrals, edge of dorsal, anal, and caudal white; no spot in front of caudal; median stripe black-brown, above yellowish green, showing yellow in water; red specks on this band on caudal half; top of head and dorsal fin black."

Cheilinus undulatus Ruppell.

Neue Wirb. Fische, Atlas, 1828, taf. 6, fig. 2; 1835, p. 20.

One specimen $4\frac{1}{8}$ inches long from Manga Riva (coral) February 4, 1905.

The following color note was found with the specimen: — "General color light brown shading to olive-green on head; spots blackish brown; no brown on cheeks and chin; white on fins except pectoral; tip of dorsal membrane red with white at points; caudal and anal less distinctly so."

SCARIDAE.

Callyodon perrico (Jordan & Gilbert).

Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 317.
Scarus perrico Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, **4**, p. 357.

Two specimens, Nos. 3122, M. C. Z. 29673, and 3123, $14\frac{1}{2}$ and $17\frac{1}{2}$ inches long respectively, probably from Perico Island, Panama Bay.

Callyodon noyesi (Heller & Snodgrass).

Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 397.
Scarus noyesi Heller & Snodgrass, Proc. Wash. Acad. Sci., 1903, **5**, p. 206, pl. 9.

One specimen, No. 3124, 21 inches long, probably from Perico Island or Panama.

Previously known only from Galapagos Islands.

CHAETODONTIDAE.

Chaetodon nigrirostris (Gill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1673.
Sarothrodus nigrirostris Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 243.

Two specimens, each $2\frac{5}{8}$ inches long and two specimens, No. 3343, M. C. Z. 29655, and No. 3354, 5 and $5\frac{1}{2}$ inches long from Acapulco and 1 specimen 6 inches long from Perico Island, Panama Bay.

The black between the eyes does not extend entirely across the interorbital space, it being simply two black blotches above the eye. The black of the opercular margin is continued across or nearly across the base of pectoral fin.

Chaetodon humeralis Günther.

Cat., 1860, **2**, p. 19. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 149.

Two specimens, Nos. 3113 and 3121, M. C. Z. 29690, respectively 5 and $4\frac{5}{8}$ inches long and two specimens, M. C. Z. 29559 each $4\frac{1}{2}$ inches long from Perico Island, Panama Bay.

Thirteen specimens, $4\frac{1}{4}$ to 5 inches long from Toboguilla Island, Panama Bay, in two fathoms.

Five specimens, Nos. 3316–18 and No. 3355, M. C. Z. 29687, No. 3356, M. C. Z. 29676, $4\frac{1}{2}$ to $4\frac{5}{8}$ inches long from Acapulco.

Color: — a dark band narrower than eye, runs from nape curving downward and forward through the eye across cheek and then curving backward to throat; another broader band from front of dorsal through the base of pectoral, then faintly to ventrals; then a broader band along base of soft dorsal and anal across caudal peduncle; a dark inframarginal band to soft dorsal and anal, rays bordered with light yellow, anal border broader than dorsal; narrow dark band across caudal peduncle at base of caudal; a broader band across base of caudal fin; another intramarginal band near tip of caudal.

Chaetodon lineolatus Quoy & Gaimard.

Cuvier & Valenciennes, Hist. Nat. Poiss., 1831, **7**, p. 31 (40).

A specimen, No. 3281, $8\frac{7}{8}$ inches long from Rikitea, Manga Reva.

In the figure given by Günther (Fische der Südsee 1874, **2**, taf. 34, fig. A.) and copied by Jordan and Evermann (Bull. U. S. Fish Comm., 1905, **23**, pt. 1, p. 365, fig. 159), the black lines are wrongly drawn obliquely, instead of vertically and following the series of scales as they are in the specimen and as Günther and Jordan and Evermann correctly describe them.

Chaetodon trifasciatus Mungo Park.

Trans. Linn. Soc. London, 1797, **3**, p. 31. Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 344.

One specimen $2\frac{3}{8}$ inches long from Manga Reva, coral.

The following color note was found with the specimen: — "Bright yellow, brighter on breast and head; bars brown, nearly black; peduncle spot black; stripes gray."

This specimen has a distinct black spot in the angle between the soft dorsal and caudal peduncle, much darker than the dusky band along base of the soft dorsal in which it lies.

Heniochus monoceros Cuvier & Valenciennes.

Hist. Nat. Poiss., 1831, **7**, p. 76 (100), pl. 176. Günther, Cat., 1860, **2**, p. 41.

One specimen, No. 3280, 6 inches long from Rikitea, Manga Reva.

Pomacanthus zonipectus (Gill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1682.
Pomacanthodes zonipectus Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 244.

One specimen $\frac{7}{8}$ inch long from Perico Island, 10–25–'04.

Holacanthus passer Valenciennes.

Voy. Venus, 1855, **5**, p. 327, pl. 6. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 150.

Two specimens, Nos. 3132 and 3151, M. C. Z. 29616, 6 and $7\frac{3}{4}$ inches long, and seven specimens, $2\frac{3}{4}$ to $4\frac{3}{4}$ inches long among coral in two fathoms of water, all from Toboguilla Island, Panama Bay.

Three specimens, Nos. 3241–43, 5 to $8\frac{1}{4}$ inches long from Wreck Bay, Chatham Island.

Four specimens, Nos. 3328–31, No. 3330, M. C. Z. 29679, No. 3331, M. C. Z. 29686, 5 to $6\frac{1}{2}$ inches long from Acapulco.

One specimen, $5\frac{1}{2}$ inches long without tag or locality.

In these specimens, there are numerous small round, grayish spots on the nape in front of dorsal; in other respects they agree with current descriptions. In some of our young examples there are coarse reticulations of blue lines on the cheek between the lines running downward from in front and from behind the eye. The color of the young is well described by Snodgrass and Heller.

TEUTHIDIDAE.

Teuthis triostegus (Linné).

Chaetodon triostegus Linné, Syst. Nat. ed. 10, 1758, p. 274.

Eight specimens each about $1\frac{1}{4}$ inches long from Manga Reva, February 3, '05. M. C. Z. 29414 (3 specimens).

Our specimens agree with Street's account (Bull. 7, U. S. Nat. Mus., p. 67) of *Acanthurus triostegus* in the color markings with the exception of those on the tail. They also agree with specimens from Samoa in Jordan and Seale's collection labeled *T. triostegus*. All of our specimens have at least traces of a bar across caudal peduncle and one across base of caudal fin. In most of them the former bar is more distinct; in one instance the bar across base of caudal is more distinct; in one instance the bar extends across caudal peduncle on one side of the specimen and on the other side only partly so.

Teuthis umbra Jenkins.

Bull. U. S. Fish. Comm., 1903, **22**, p. 477.

Two examples, Nos. 3181 and 3164, M. C. Z. 29677, $8\frac{1}{4}$ and $6\frac{1}{4}$ inches long, from Cook Bay, Easter Island.

Comparing these specimens with a specimen from Hawaii, we find them identical in color, except that the white on the base of the caudal is not so evident, but it is very faint in the Hawaiian specimen. The profile between the snout and front of eyes is a little more concave in our specimen; the caudal fins are similar in emargination.

For purposes of comparison we give the following measurements of our specimens and of the Hawaiian specimen.

No. 3181 has, head 3.77 in length without caudal; depth 1.70; eye 4.09 in head; snout 1.19; interorbital 2.81; dorsal IX, 25; anal III, 22.

No. 3164 has, head 3.68 in length; depth 1.66; eye 3.77 in head; snout 1.30; interorbital 2.83; dorsal IX, 25; anal III, 23.

The Hawaiian specimen, $7\frac{3}{4}$ inches long, has head 3.66 in length; depth 1.70; eye 4.10 in head; snout 1.32; interorbital 2.82; pectoral 3.33; dorsal IX, 27; anal III, 23.

Ctenochaetus striatus (Quoy & Gaimard).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 399, fig. 174.
Acanthurus striatus Quoy & Gaimard, Voy. Uranie. Zool., 1825, p. 373, pl. 63, fig. 3.

Thirteen specimens 3 to 4 inches long from Manga Reva, February 4, 1905. M. C. Z. 29405 (3 specimens).

The dorsal varies from $29\frac{1}{2}$ to $31\frac{1}{2}$, and the anal from $27\frac{1}{2}$ to $29\frac{1}{2}$. These were taken among the coral reefs. The following color note made by Mr. Chamberlain was in the bottle with the specimens: — "They are quite dark in color, showing indistinct darker stripes, which are plainest on caudal region and back; faint pale stripes show on dorsal and anal."

The bodies of the specimens show no stripes, but they are evident on the fins; pectoral pale yellowish; the upper ray being margined with black; dorsal and anal each have a narrow black margin. These fins are usually much darker than body color, but in a few specimens they are about the same color; caudal deeply lunate when spread, and appears forked when not spread, the upper and lower rays being greatly produced, this fin is usually darker in color than the body, the rays being darker than the membranes and in some instances the outer rays are each margined with white, the lunate border shows in all the specimens with a narrow margin of white.

Zebrasoma veliferum (Bloch).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 396, fig. 173.
Acanthurus velifer Bloch, Ausl. Fische, 1795, **9**, p. 106. taf. 427, fig. 1.

One specimen $5\frac{1}{2}$ inches long, No. 3293, from Rikitea, Manga Reva.

Xesurus punctatus (Gill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1695.
Prionurus punctatus Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 242.

Three specimens, Nos. 3313, M. C. Z. 29630 and 3336–7, respectively $9\frac{3}{4}$, 15 and 10 inches long from Acapulco.

Xesurus clarionis Gilbert & Starks.

Proc. U. S. Nat. Mus., 1897, **19**, p. 445, pl. 51. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1695.

Two specimens, Nos. 3211, 3212, M. C. Z. 29678, 13 and $7\frac{1}{4}$ inches long from Wreck Bay, Chatham Island.

SIGANIDAE.

Siganus rostratus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 360.
Amphicanthus rostratus Cuv. & Val., Hist. Nat. Poiss., 1835, **10**, p. 116 (158).

Two specimens 5 and $6\frac{1}{4}$ inches long from Manga Reva, coral. M. C. Z. 29431 (1 specimen).

SCORPAENIDAE.

Sebastopsis xyris Jordan & Gilbert.

Proc. U. S. Nat Mus., 1882, **5**, p. 369. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 414.

Fifteen specimens $2\frac{1}{2}$ to $4\frac{1}{4}$ inches long from Chatham Island, Galapagos near shore. M. C. Z. 29412 (5 specimens).

Scorpaena mystes Jordan & Starks.

Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 491. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 161.

One specimen, No. 3213, M. C. Z. 29718, 12 inches long from Wreck Bay, Chatham Island.

One specimen, No. 3375, $14\frac{3}{4}$ inches long from Acapulco.

? Scorpaena histrio Jenyns.

Zool. Voy. Beagle, Fish., 1842, pt. 4, p. 35, pl. 8. Snodgrass & Heller, Proc. Wash. Acad. Sci. 1905, **6**, p. 415.

One specimen $\frac{7}{8}$ inches long from shore at Chatham Island.

GOBIIDAE.

Dormitator maculatus (Bloch).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2196
Sciaena maculata Bloch, Ausl. Fische, 1792, **6**, p. 44, pl. 299, fig. 2.

Seven specimens $\frac{15}{16}$ to $4\frac{9}{16}$ inches long from one mile south of Panama City. M. C. Z. 29426 (3 specimens).

Gymneleotris seminudus (Günther).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2204.
Elcotris seminudus Günther, Proc. Zool. Soc. London, 1864, p. 24, pl. 4. figs. 2, 2a.

One specimen $1\frac{5}{16}$ inches long from Acapulco.

This is the second specimen of this species known. The Type is in the British Museum.

In our specimen the well-defined cross-stripes are a little more regular than shown in Günther's figure.

Gobius rhizophora Heller & Snodgrass.

Proc. Wash. Acad. Sci., 1903. **5**, p. 212, pl. 12.

Two specimens $1\frac{3}{16}$ and $1\frac{1}{4}$ inches long from Chatham Island. M. C. Z. 29597.

These specimens have been compared with the Types of *Gobius zebra*, which are very small individuals differing in coloration, having the dark cross-bars narrow; the light interspaces, traversed mesially by a dark line, are broad; in *G. rhizophora* the dark cross-bars are wide, the light interspaces narrow.

Gobius gilberti Heller & Snodgrass.

Proc. Wash., Acad. Sci., 1903, **5**, p. 214, pl. 13.

Two specimens, $\frac{3}{4}$ and $\frac{13}{16}$ inches long from Chatham Island. M. C. Z. 2959 (1 specimen).

Mapo soporator (Cuvier & Valenciennes).

Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 416.
Gobius soporator Cuv. & Val., Hist. Nat. Poiss., 1837, **12**, p. 42 (56).

Nineteen specimens, $\frac{5}{8}$ to $3\frac{5}{8}$ inches long from Chatham Island.

Forty-five specimens, $\frac{9}{16}$ to $3\frac{1}{16}$ inches long from Perico Island, Panama Bay. M. C. Z. 29391 (22 specimens).

Thirty-three specimens, $\frac{11}{16}$ to $3\frac{3}{4}$ inches long from Manga Reva. Two of these have seven dorsal spines, the others have six. The following color note was with part of the specimens from Manga Reva: — "Light brown shades; spots pearly; brownish on dorsal and caudal; general shade very dependent on character of bottom."

Kelloggella oligolepis (Jenkins).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1905, **23**, pt. 1, p. 488, fig. 215.
Enypnias oligolepis Jenkins, Bull. U. S. Fish. Comm., 1904, **22**, p. 504, fig. 45.

Ten specimens $\frac{3}{4}$ to $1\frac{1}{4}$ inches long from La Perouse Bay, Easter Island, shore. M. C. Z. 29400 (1 specimen), M. C. Z. 29614 (4 specimens).

These specimens show some variation in the number and width of the cross-bars. They have been compared with the Type from Honolulu and differ from it in having pale vertical fins. The Type has blackish dorsal and dusky caudal. One of the specimens recorded by Jordan and Evermann from Waianae, Hawaii, has caudal faintly barred. We can not detect, on the Type, the few small scales said to be on the posterior part of the body.

Gobiosoma crescentale GILBERT.

Proc. U. S. Nat. Mus., 1892, **14**, p. 557. JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2259.

Two specimens 2 and $2\frac{3}{4}$ inches long from Chatham Island, shore. M. C. Z. 29603 (1 specimen).

Proportional measurements of the two specimens.

Length to base of caudal	56 mm.	42 mm.
Head in length	3.73	3.50
Depth in length	6.22	6.
Eye in head	5.	5.33
Snout in head	5.	5.33
Pectoral in length	1.07	1.33
Ventral in length	1.36	1.33
Dorsal	VII–12	VII–12
Anal.	11.	11.

Color, gray, mottled with brown; sides of head with alternate brown and pale bars; opercle pale with faint dark spots; pectoral light gray with a faint crescent-shaped dark bar at base, preceded by a brighter area; dorsal and anal gray, with a blackish edge to anal membrane anteriorly; caudal dusky with a faint indication of crescent at base; ventral pale. The smaller specimen is similarly colored with the markings more distinct. Some of the brown markings on the body, especially anteriorly, tend to form irregular pairs of cross-bars.

DACTYLOSCOPIDAE.

Gillelus rubellulus, sp. nov.

Plate 6, fig. 3.

Type No. 65510, U. S. N. M., $2\frac{5}{16}$ inches long, from Chatham Island.

Lower jaw somewhat projecting; maxillary reaching to a line from posterior margin of orbit; both lips with a small fringe; anterior nostril small, tubular; opercular fringes well developed, nine in number; teeth in each jaw in a band in front, narrowing posteriorly; anterior portion of lateral line running along base of dorsal (one row of scales between it and base of fin) and descending downward to middle of side opposite last unjointed ray.

The rays of the ventral fin are connected by a thin transparent membrane.

Color in alcohol: — ground color pale straw tinged above with pinkish; head, back, and sides thickly spotted and blotched with pearly white; lips

white with four narrow cross-bands; a narrow longitudinal black bar across eye through pupil, extending on to preorbital; scattered black dots on head; four small black dots in a row across nape at the junction of the occiput; back with five broad cross-bars of pink, thickly punctulated with brown, narrowly margined in front and back with dark brown, ending about middle of sides in large specimens, in smaller extending nearer ventral surface; the first extending from posterior part of first dorsal to the pectoral; the second beginning about middle of second dorsal and extending but slightly below lateral line; third beginning opposite posterior part of second dorsal and ending about middle of side; fourth beginning about middle of third dorsal and extending to lateral line; fifth extending across base of caudal; first dorsal pink; second and third translucent with black dots on each ray; anal pale translucent; pectoral has a row of black spots extending about half across fin and situated about $\frac{1}{3}$ of the distance from base to tip of fin; caudal with about four faint cross-bars. Second specimen similarly colored; interspaces between bands with scattered brown dots; rays of outer half of pectoral with a few black spots; the second cross-bar extending to about middle of body; the third nearly to anal, the fourth almost touching anal. The third specimen has no brown spots on body; the cross-bars extend to the middle line of body. The smallest specimen is colored like the third except that the fourth cross-bar extends nearly to the anal.

Proportional measurements.

	Type	Cotype	Cotype	Cotype
Total length in inches	2.31	1.9+	1.69	1.5
Length of base of caudal in mm.	50	42	38	35
Head	4.16	3.81	3.80	4.37
Depth	5.55	5.25	5.42	5.38
Eye	6.	5.50	5.00	4.00
Snout	6.	5.50	5.00	4.00
Interorbital	8.57	11.	6.66	8.00
Maxillary	2.4	2.44	2.50	2.18
Dorsal	III–XV, 15	III–XV, 17	III–XV, 16	III–XV, 17
Anal	II, 28	II, 27	II, 27	II, 27
Scales	23+3+16	22+3+16	21+3+16	23+3+16

Dactyloscopus pectoralis GILL.

Proc. Acad. Nat. Sci. Phil., 1861, p. 267. JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2301.

Three specimens $1\frac{1}{8}$ to $1\frac{3}{4}$ inches long from Chatham Island, shore. M. C. Z. 29615 (1 specimen).

Measurements of largest specimen were as follows: — Head 3.8 in body without caudal, 4.19 in total length; depth 6.15 in body without caudal, 6.76 in total length; eye equal to interorbital, 10.5 in head; breadth of head at its junction with nape 1.9 in length of head; maxillary 3.00 in head; dorsal XII, 25, the first three dorsal rays free, without membrane, the 4th provided with a membrane joining it to base of 5th; A. II, 28; scales in lateral line 12+4+26=42.

Both lips are strongly fringed, anterior nostrils are placed on edge of preorbital, with long tubes, which, when depressed, reach nearly to orbit; opercle with about ten rays or cilia.

Color in alcohol: — (specimen was somewhat dried). Head above white, a narrow, wavy dark line extending from back of eye downward and backward to edge of preopercle; another fainter line from lower front of eye, downward and backward to behind corner of mouth; body straw colored; a large quadrate brown spot on nape, from this a series of brown spots extend downward across interopercle; back, along base of dorsal, white; a small brown spot on each side of nape; six small quadrate brown spots at the base of the dorsal, the last one being above the 18th scale of the straight portion of the lateral line; pectoral with two faint dusky cross-bars, one near base, other near middle of fin, rest of fin whitish; other fins yellowish translucent.

The second specimen has, D. XII, 24; A. II, 26; scales 12 + 4 + 26; it has general straw color of preceding, markings similar; seven quadrate spots along base of dorsal; a faint spot at base of caudal; some of the scales on intermediate spaces margined with brown; some of the scales along the lateral line, anteriorly, punctulate with brown; pectoral without cross-bars.

The smallest specimen has, D. XII, 24; A. II, 27; scales 12 + 4 + 26; coloration similar to preceding; seven quadrate spots; no dusky spots on interspaces between quadrate spots; no punctulations along scales of lateral line; pectoral plain.

These specimens have a longer head and more dorsal rays than given in description of *D. pectoralis*, but seem to agree with the latter in other respects.

BLENNIIDAE.

Enneanectes carminalis (JORDAN & GILBERT).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2350.
Tripterygium carminale JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, **4**, p. 362.

One specimen $1\frac{3}{4}$ inches long from Acapulco.

Dorsal III–XII–9; anal II, 16; scales 33.

General color in alcohol, dull reddish brown; muzzle, gular region and gill-membranes pale; a short dusky bar from eye downward and backward to tip of maxillary; diffuse dusky blotch on opercle; scales with dusky margin; five broad dark brown cross-bars on body, the first extending from front of second dorsal, third from front of soft dorsal, fourth from just anterior to posterior end of soft dorsal; fifth across caudal peduncle; on the interspaces between second and third and third and fourth cross-bars a narrow dusky line extending downward from lateral line, and between fourth and fifth a narrow dusky cross-bar; membrane of first dorsal and anterior part of second dorsal black, rest of dorsal fins pale; ventrals pale; pectorals pale with about five broad faint dusky wavy cross-bars; anal pale, membrane broken and gone; caudal pale with a narrow dusky bar across base, followed by a diffuse dusky blotch, and a broad jet black terminal margin.

We also have seven other small specimens $\frac{15}{32}$ to $\frac{25}{32}$ inch long from Acapulco, anal rays 16 and 17. M. C. Z. 29587 (4 specimens).

The general color is pale straw. Five of these have three black spots with white centres on the top of head, one of the spots is behind each eye and one of occiput just before first dorsal; another (the smallest) has the three black dots similarly situated but without the white centre; another (the largest) has but one black spot, it is on the occiput and lacks the white centre; a short black cross-bar at posterior base of isthmus in front of ventral, another on belly just back of base of ventral; a black dot at base of each soft dorsal ray and two on top of caudal peduncle and two on its lower edge; base of each anal ray black, this color joined to the ray behind it by a black line; a black line across base of caudal.

The largest of these seven specimens shows traces of dusky bars on caudal fin.

Jordan and Evermann (*loc. cit.*) state that the anal is II, 11 (misprinted II, 17) in the original description. This could not be verified from the fact that the Type can not be found. The present specimens, if correctly identified, show that the original count was probably correct.

Malacoctenus delalandii (Cuvier & Valenciennes).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2358.
Clinus delalandii Cuv. & Val., Hist. Nat. Poiss., 1836, **11**, p. 279 (378).

One specimen $2\frac{1}{8}$ inches long from Perico Island, pool.

One specimen, M. C. Z. 29607, $1\frac{9}{16}$ inches long from Acapulco.

Malacoctenus zonogaster Heller & Snodgrass.

Proc. Wash. Acad. Sci., 1903, **5**, p. 217, pl. 6.

Thirty-two specimens $\frac{15}{16}$ to $3\frac{5}{16}$ inches long from Chatham Island, shore. M. C. Z. 29410 (12 specimens).

Labrisomus jenkinsi Heller & Snodgrass.

Proc. Wash. Acad. Sci., 1905, **5**, p. 219, pl. 16.

One specimen, 4 inches long from Chatham Island, shore.

The dorsal XIX, 11; vomerine series of teeth extend back for a short distance on to the palatines. Numerous small brown spots on under side of head and throat. This specimen was found with *Alticus atlanticus*.

Mnierpes macrocephalus (Günther).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2364.
Clinus macrocephalus Günther, Cat., 1861, **3**, p. 267.

Nine specimens 2 to $4\frac{1}{2}$ inches long from Perico Island, Panama Bay, in one fathom. M. C. Z. 29424 (3 specimens).

Two specimens $3\frac{1}{8}$ to $3\frac{1}{2}$ inches long from Toboguilla Island, under a stone, eighteen feet from waters at low tide.

Auchenopterus monopthalmus Günther.

Cat., 1861, **3**, p. 275. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 189.

Three specimens $\frac{13}{16}$ to $1\frac{7}{8}$ inches long from Perico Island, October 25, 1904. M. C. Z. 29598 (1 specimen).

? Emmnion bristolae Jordan.

Proc. U. S. Nat. Mus., 1897, **19**, p. 454, pl. 55, fig. 1.

Many young specimens $\frac{5}{8}$ to $\frac{3}{4}$ inch long from Acapulco, attracted by using electric light. M. C. Z. 29604.

These specimens cannot be positively identified but they have the appearance and fin-ray counts described by Jordan and the lateral line is straight and runs near the back. The species has not been reported since the original record. It is possible that they are the young of some other blenny.

Runula azalea Jordan & Bollman.

Proc. U. S. Nat. Mus., 1890, **12**, p. 171. Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 419.

Nine specimens $1\frac{3}{8}$ to $2\frac{1}{8}$ inches long from Acapulco, shore. M. C. Z. 29609 (2 specimens).

The following note was with these specimens: — "Stripe on back bright yellow; first dorsal red; belly pinkish. In large schools, abundant about rocks."

In these specimens the anal has uniformly 29 rays.

Two specimens $1\frac{3}{4}$ and $1\frac{7}{8}$ inches long from Acapulco.

Three specimens $1\frac{5}{8}$ and $2\frac{3}{4}$ inches long from Chatham Islands, shore. M. C. Z. 29599 (1 specimen).

Dialommus fuscus Gilbert.

Proc. U. S. Nat. Mus., 1891, **13**, p. 452. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2868.

Two specimens, $2\frac{5}{16}$ and $2\frac{7}{8}$ inches long from Chatham Island, shore.

The "oblique pigmented band" of the eye is more nearly vertical than in Anableps. One specimen, M. C. Z. 29611, $1\frac{13}{16}$ inches long from Perico Island, tide pool.

Enneapterygius corallicola, sp. nov.

Plate 7, fig. 1.

Two specimens $1\frac{5}{16}$ and $1\frac{7}{16}$ inches long from Chatham Island, shore.

Type, No. 65484, U. S. Nat. Mus., $1\frac{7}{16}$ inches long, from Chatham Island.

Head 3.44 in length; depth 4.76; eye 3; snout 3.50; maxillary 2.25; dorsal III–XV, 13; anal 23; scales 29+10.

In the $1\frac{5}{16}$ inch specimen, M. C. Z. 29492, the dorsal is III–XV–14; anal 23, scales 27+12.

Each specimen has a small simple nasal cirrus and a larger simple ocular cirrus.

Color brownish gray; a dark line downward from eye across cheek; a broad dark bar from posterior part of eye to margin of opercle, widest posteriorly; back light brown with five indistinct pairs of dark brown cross-bars extending to about middle of side, most intense ventrally and coalescing below lateral line; dorsal pale with faint longitudinal stripes, widest on spinous dorsal; anal membrane dusky, rays yellowish; pectoral straw colored, a diffuse black blotch at base, faint dark bar across middle, tip somewhat dusky; caudal translucent with faint dusky cross-bars; first dorsal black. The small specimen has same coloration as preceding except that it has no cross-bar on pectoral. Teeth in both jaws in villiform bands at least two enlarged teeth on lower jaw anteriorly. Scales ctenoid; pectoral scaly at base, scales extending some distance on fin.

Alticus atlanticus (Cuvier & Valenciennes).

Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 419.
Salarias atlanticus Cuv. & Val., Hist. Nat. Poiss., 1836, **11**, p. 238 (321).

Five specimens $1\frac{5}{8}$ to $5\frac{3}{8}$ inches long from Chatham Island, shore. M. C. Z. 29447 (2 specimens).

In the smallest specimen the cross-bars on the body are distinct; the upper two thirds and the inner base of pectoral is much lighter than the ground color.

Alticus striatus (Quoy & Gaimard).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 423.
Salarias striatus Quoy & Gaimard, Cuv. & Val. Hist. Nat. Poiss., 1836, **11**, p. 228 (309).

Two specimens, M. C. Z. 29436, $2\frac{1}{16}$ and $2\frac{7}{16}$ inches long from Easter Island, shore.

The large female specimen with eggs gives the following measurements: — head 4.41 in length; eye 4.80 in head; interorbital 2 in eye; ocular tentacle, acutely triangular, fringed on one side; nasal cirrus palmate; a simple cirrus on each side of nape at junction of occiput; upper lip with lobate margin; large hooked teeth posteriorly in each jaw; dorsal XII–15, not extending on to the caudal; anal 16, with one papilla in front; no crest.

Color in alcohol, head light brownish, with purplish area on upper posterior part of cheek; a faint dusky, short band-like area at corner of mouth; broad faint dusky bar from front part of each eye across lip, and one midway between; an oblong black spot on side of head, behind eye and directed upward and backward, apparently ocellated in life; no bands or spots evident on throat or gill-membranes; faint brownish saddle-like bar across back at insertion of spinous dorsal, not extending down to pectoral; seven pairs of dark brown bars, somewhat interrupted, on the side of the body, the fourth pair situated under the notch between the dorsals, one of the pairs extending down from posterior part of spinous dorsal, another from origin of soft dorsal; pectoral translucent, punctulate with dusky, most intense on lower rays; ventrals pale, finely punctulate with dusky; spinous dorsal translucent, finely punctulate with dusky, in large rather indefinite spots, approximating two rows, those near the outer margin to some extent coalescing and forming an irregular dusky inframarginal band, margin pale; soft dorsal translucent, finely and faintly punctulate, about three blackish spots on each ray forming about nine or ten downward and backward series or partial series of spots; anal similar in appearance to spinous dorsal; caudal plain translucent with about seven small blackish spots on each ray

forming wavy cross series. The other specimen, a male $2\frac{1}{16}$ inches long taken at the same place and time has similar coloration; dorsal XII–14; anal 16+2; papillae in front. We have four other specimens $1\frac{1}{16}$ to $2\frac{11}{16}$ inches long from Easter Island, shore.

The $2\frac{11}{16}$ inch specimen is a female with eggs, has no crest, and dorsal XII–14; anal 1, 16.

Another $2\frac{5}{16}$ inches long, a female with eggs, no crest; dorsal XII–15; anal 1, 16.

Another $2\frac{5}{16}$ inches long, a female with eggs, no crest; dorsal XII–14; anal 1, 16.

A male $2\frac{7}{8}$ inches long, from Samoa and identified by Jordan and Seale as *A. striatus*, has practically the same coloration except that the markings on the fins are a little coarser and darker and there are white streaks on under part of head (throat) converging backward. This specimen gives the following measurements, head 4.36 in length; depth 5.54; eye 4 in head; interorbital 2.33 in eye; a fringed tentacle on top of eye; nostril tentacle palmate; a simple tentacle on each side of nape; dorsal XII–16; anal 1, 18.

We have compared the type of *A. thalassinus* Jordan and Seale with our specimens and cannot find that it differs. The Type is a young fish and considerably faded, but there are evident traces of the color markings of *A. striatus*, and it agrees in all other respects.

Alticus periophthalmus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 422.
Salarias periophthalmus Cuv. & Val., Hist. Nat. Poiss., 1836, **11**, p. 311.

Two specimens 1 and $4\frac{1}{4}$ inches long from Manga Reva, outer reef. M. C. Z. 29551 (1 specimen).

The following color note was in bottle with specimen: — "General color yellowish, large blotches brown, small spots red-brown, eye red-brown, dashes on sides pearly, with black margins."

Alticus variolosus (Cuvier & Valenciennes).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 424.
Salarias variolosus Cuv. & Val., Hist. Nat. Poiss., 1836, **11**, p. 235 (317).

Three specimens $2\frac{1}{8}$ to $4\frac{1}{8}$ inches long from Easter Island, shore. M. C. Z. 29539 (1 specimen).

One specimen $1\frac{13}{16}$ inches long from La Perouse Bay, Easter Island, shore.

Alticus biseriatus (Cuvier & Valenciennes).

Salarias biseriatus Cuv. & Val., Hist. Nat. Poiss., 1828, **11**, p. 316 (234). Günther, Fische der Südsee, 1877, 6, p. 208.

Plate 7, fig. 2.

Six specimens $1\frac{7}{8}$ to $2\frac{9}{16}$ inches long from Manga Reva. M. C. Z. 29408 (2 specimens).

The following color note in bottle with specimens: — "General color brownish; spots below 1st dorsal dark brown; black on crest and fins, lighter vermiculations under second dorsal, pearly."

The largest specimen, a male, $2\frac{9}{16}$ inches long, has the following measurements: — Head 4.5 in total length without caudal; depth 5.75; eye 4.00 in head; D. XII, 20; A. 22; soft dorsal separate from caudal fin; interorbital very narrow; ocular cirrus long and fringed on both sides; nasal cirrus small and simple; none on nape; crest well developed.

Color in alcohol, head purplish gray above, very light below, the gray of top of head extending as narrowing streaks across the cheeks, gill-membranes and opercles; two streaks starting at lower posterior margin of eye, extending obliquely backward, uniting behind corner of mouth into a single dark line; a dark line from each corner of mouth on throat, converging posteriorly but not quite meeting; in front of these two similar lines meeting; about eight narrow dark lines or bars across upper lip; crest blue-gray with twelve or fourteen small round black spots on its posterior two thirds and one on anterior portion, a jet black pale edged margin above the posterior spots; pectoral pale, finely punctulate with dusky; spinous dorsal gray with about six large, poorly defined brown spots along base, and a broad irregular brown narrowly pale edged margin, membranes with numerous small brown spots and dots; soft dorsal grayish with a margin similar to spinous dorsal and numerous narrow white lines running obliquely downward and forward; anal pale at base, outer two thirds dusky; caudal with a brown spot at base of middle rays, base of caudal otherwise yellowish, remainder translucent, crossed about its middle with a broad faint brown bar, the lower rays and terminal margin broadly dusky; belly plain white; back and sides, anterior margins of soft dorsal and anal gray with numerous round brownish spots, around which the ground color makes pale vermiculations; about four pairs of broad irregular brown cross-bars on body under soft dorsal and on caudal peduncle; commencing just back of a point above the origin of anal is a longitudinal series of short white lines and spots which termi-

nate at lower edge of brown caudal spot; between this series and the soft dorsal are numerous round white spots and vermiculate white lines.

A female $2\frac{9}{16}$ inches long has the following measurements: — head 4.54 in total length without caudal; depth 5.55; eye 4.05 in head; dorsal XII, 20; anal II, 20; interorbital very narrow; ocular cirrus long and fringed on both sides; nasal cirrus comparatively long and simple; no cirrus on nape; crest well developed.

Color of head and body very similar to that of the male, but on the middle of the under lip there are two short converging lines; pectoral, ventral, anal, and caudal pale, but finely punctulate with dusky; caudal having a yellowish area and brown spots at its base; 1st and 2nd dorsal similar to those of male, but much paler.

Of the remaining four specimens three are females having dorsal XII, 19 and anal ii, 20, the two anterior represented by the ii being shorter than the others, the first papilla-like, and separated from the rest of the fin; the second connected by a membrane and may be considered a ray.

The fourth and smallest specimen is a male having dorsal XII, 20 and anal ii, 21, the anterior of which is a simple papilla and the second a short ray connected by a membrane to the rest of the fin.

These specimens agree perfectly with the description of *Salarias biseriatus* Cuvier and Valenciennes (*loc. cit.*) and the description and figure by Kner in Novara Reise Fische, 1865, p. 197, taf. 8, fig. 4, with the exception that both of these authors state that there are no posterior canine teeth on the lower jaw; the present specimens possess large canine teeth, although their location is such that they might be easily overlooked. Dr. Steindachner has kindly sent us one of Kner's specimens taken at Tahiti. Upon examination we find that it possesses large canines well back in the mouth but in such a position as to be easily overlooked. It is a female without crest, containing well-developed eggs.

Specimens in the Reserve Series of the U. S. Bureau of Fisheries have been misidentified as *Salarias biseriatus* by Jordan and Seale, Bull. U. S. Bur. Fish. 1906, **25**, p. 427. These we describe as

Alticus margaritatus, sp. nov.

Plate 7, fig. 3, Plate 8, fig. 1.

Twenty-seven specimens $\frac{3}{4}$ to $2\frac{5}{8}$ inches long from Pago Pago, Samoa.

The Type, No. 65409 U. S. N. M., a male $2\frac{5}{8}$ inches long has the following measurements: Head 4.66 in total length without caudal; depth 5.35; eye 4.51 in head; dorsal XII, 18; anal 21.

Canines present, orbital cirrus developed only on right side, comparatively long with very short fringes; nasal cirrus on left side simple, on right side with two short branches at base; no cirri on nape; crest long, of moderate height, extending from between eyes almost to first dorsal; dorsal deeply notched; first slightly connected with second by membrane; first dorsal with rather high flexible spines, but somewhat lower than soft dorsal; anal considerably lower than soft dorsal; dorsal and anal entirely separate from caudal.

General color warm brown, paler on belly; head with a slight purplish tinge, darker on snout and lips; only a slight trace of cross-bars; numerous small pale pearly spots, most numerous posteriorly, below median line forming a longitudinal series arranged more or less in pairs; above the median line these having no regular arrangement; larger pale areas on body above anal base. Crest on head dark brown, thickly dotted with small pearly or bluish spots; pectoral dark brown; spinous dorsal dark brown with a series of large oblique oblong black spots, one on each interspinous membrane; second dorsal dark brown with numerous narrow pale, very oblique streaks running upward and backward, their widths about equal to the interspaces, barely perceptible to the naked eye; caudal dark brown, appearing almost black to the naked eye; anal dark brown, with darker margin; ventral short, black.

A cotype, a female $2\frac{5}{16}$ inches long has following measurements:— head 4.25 in total length without caudal; depth about 5.; eye 4.50 in head; dorsal XII, 18; anal i, 20. Cirrus above eyes quite long and strongly fringed; a short simple cirrus above each anterior nostril; no cirrus on nape; crest low, shorter than in male, commencing above posterior margin of eye and extending to junction of nape with occiput.

General body color paler than in male; about six pairs of faintly defined dark brown cross-bars; the pearly spots are more distinct than in male and more numerous anteriorly; those at base of anal scarcely discernible; head covered with small dusky spots; crest without white dots; vertical fins paler than in male; large black spots present only on first and second interspinous membranes; soft dorsal similar to that of male but paler; anal paler, each ray tipped with white; caudal lighter than in male; pectoral dusky olive; ventral pale, punctulated with dusky dots.

Younger individuals much paler, cross-bars and spots becoming more distinct; some with an oblong dusky spot behind eye. The smaller specimens have no crest. The fin-ray counts in these specimens run as follows:— dorsal XII–XIII, 17 to 18; anal 19 to 21.

Salarias lineatus Cuvier & Valenciennes.

Hist. Nat. Poiss., 1836, **11**, p. 232 (314). Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 426.

Four specimens, three of them females $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long and one male $4\frac{3}{8}$ inches long, all from Manga Réva, Paumotus. M. C. Z. 29537 (2 specimens).

The following color note was found with these: — "General color brownish slate; stripes pale greenish, black and white margins on the soft dorsal, the brown stippling [on] caudal parts."

Salarias edentulus (Bloch & Schneider).

Günther, Fische der Südsee, 1877, **6**, p. 206, pl. 117, fig. A.
Blennius edentulus Bloch & Schneider, Syst. Ichth., 1801, p. 172.

Thirty-nine specimens, $1\frac{1}{4}$ to $4\frac{7}{8}$ inches long from Manga Reva. M. C. Z. 29422 (9 specimens).

The following color note was found with these specimens: — "Those with crest, bars slate light green, belly white, lips and chin darker. Tip of anal rays pale slate, membrane nearly black. In some, brown vermiculations over green bars. Those without crest — similar to others, with dark brown spots on caudal portion and dorsal and anal fin."

These specimens bear out the conclusions of Günther (*loc. cit.*) regarding the sex of this species and the identity of *S. edentulus* and *S. rivulatus*. Eleven of these are adult males $3\frac{3}{16}$ to $4\frac{1}{16}$ inches long, possessing the color of *S. rivulatus* and the crest on the head.

Twenty-three of these, $2\frac{13}{16}$ to $4\frac{7}{8}$ inches long are adult females, of these twenty are without a crest, or with a slight indication of crest, the remaining three, which are the largest have a low but distinct crest. These conform in color with *S. edentulus*. There are five young individuals $1\frac{1}{4}$ to $1\frac{3}{8}$ inches long, which do not show any crest, and the coloration is not easily made out. All of the above of both sexes in addition to the fringed cilia on the nostril and the simple one above the eye, have one on each side of the nape close to the occiput.

BROTULIDAE.

Ogilbia ventralis (Gill).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2503.
Brosmophycis ventralis Gill, Proc. Acad. Nat. Sci. Phil., 1863, p. 253.

Two specimens $2\frac{9}{16}$ and $3\frac{5}{8}$ inches long from Acapulco. M. C. Z. 29541 (1 specimen).

The statement by Jordan and Evermann (*loc. cit.*) that the snout is 7 in head must be a mistake as Gill gives it as 5 and from an examination of his Types and of our specimens it is found to be $4\frac{1}{2}$ to 5, depending somewhat on the size of the specimen.

Petrotyx hopkinsi Heller & Snodgrass.

Proc. Wash. Acad. Sci., 1903, **5**, p. 222, pl. 18.

One specimen $5\frac{5}{8}$ inches long from Chatham Island, shore.

BATRACHOIDIDAE.

Batrachoides pacifici (Günther).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2314.
Batrachus pacifici Günther, Cat., 1861, **3**, p. 173.

Two examples, Nos. 3140, 3141, M. C. Z. 29712, $8\frac{1}{2}$ and 11 inches long from Panama Bay.

GOBIESOCIDAE.

Gobiesox erythrops JORDAN & GILBERT.

Proc. U. S. Nat. Mus., 1882, **4**, p. 360.

One specimen $1\frac{3}{8}$ inches long from Chatham Island.

Arbaciosa truncata HELLER & SNODGRASS.

Proc. Wash. Acad. Sci., 1903, **5**, p. 216, pl. 14.

Twenty-one specimens, $1\frac{3}{16}$ to $1\frac{3}{4}$ inches long from Chatham Island, shore.

These specimens agree very well with the original description except that the prevailing ground color of the back is reddish brown instead of olive-yellow. The character of the teeth is as stated by Heller and Snodgrass, the principal difference between this species and *A. zebra*.

Arbaciosa zebra (JORDAN & GILBERT).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2341.
Gobiesox zebra JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, **4**, p. 359.

Seven specimens $\frac{13}{16}$ to $1\frac{5}{16}$ inches long from Toboguilla Island, M. C. Z. 29602 (2 specimens).

ECHENEIDIDAE.

Echeneis remora LINNÉ.

Syst. Nat., ed. 10, 1758, p. 260.

Two specimens, Nos. 3205, M. C. Z. 29714, 3206, $6\frac{1}{8}$ to $7\frac{1}{2}$ inches long from Station 4715, Lat. 2°, 40.4′ S., Long. 90°, 19.3′ W., taken from a shark.

PLEURONECTIDAE.

Platophrys constellatus JORDAN.

Rept. U. S. Fish. Comm. for 1886, 1889, p. 264, 266.

Number 3288, a deformed specimen lacking caudal and caudal peduncle, $7\frac{1}{2}$ inches long, from Manga Reva.

? Platophrys leopardinus (GÜNTHER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2666.
Rhomboidichthys leopardinus GÜNTHER, Cat., 1862, **4**, p. 434.

Plate 8, fig. 2.

Sixteen specimens, larval forms, ranging in length from $\frac{1}{2}$ to $1\frac{11}{16}$ inches, from the surface at Station 4640, Lat. 0°, 39.4′ N.; Long. 88°, 11′ W.

Another specimen, M. C. Z. 29605, $9\frac{9}{16}$ inches long from Station 4588, Lat. 19°, 52′ N.; Long. 106°, 22′ W.

Another specimen 1 inch long from Station 4714, Lat. 4°, 19′ S.; Long. 91°, 28.5′ W. Dorsal 92; anal 65.

One specimen $\frac{13}{16}$ inches long from Station 4644, Lat. 2°, 13.3′ S.; Long. 89°, 42.2′ W. Dorsal 87; anal 68.

One specimen $\frac{11}{16}$ inches long from Station 4716, Lat. 2°, 18.5′ S.; Long. 90°, 2.6′ W. Dorsal 87; anal 65.

One specimen $1\frac{1}{4}$ inches long from Station 4592, Lat. 18° 20′ N.; Long. 103°, 40′ W.

One specimen, $\frac{7}{8}$ inch long from Station 4611, Lat. 10° 33′ N.; Long. 88°, 30′ W.

These specimens ranging gradually from $\frac{1}{2}$ to $1\frac{11}{16}$ inches have the eyes symmetrical. The eyes are just as symmetrical in the largest as in the smallest and the structure of the specimens superficially shows no great difference in the various sizes. Dorsal 86 to 90; anal 65 to 68. These specimens are provisionally identified with this species, mainly because they agree in dorsal fin ray counts more closely than with *P. constellatus*, the other species recorded from the Galapagos Islands. They show no color markings or pigmentation.

SOLEIDAE.

Achirus mazatlanus (Steindachner).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 505.
Solea mazatlanus Steindachner, Sitzb. Ak. Wiss. Wien, 1869, **60**, p. 267.

One specimen, $4\frac{3}{4}$ inches long from Panama Market, October 28, 1904.

Depth 1.60 in length without caudal; head 3.5; gape 2.95 in head; eye 10.2; interorbital 1 in eye; scales about 70; dorsal 57; anal 45; pectoral 5, middle ray about twice as long as the others; no pectoral on blind side; two ventrals, each consisting of five rays, that on the eyed side on the ridge and continuous with anal, somewhat lower on other side and not continuous; upper and lower margins of caudal rounded, the rays graduated in length from the base to the fifth ray, in each margin, the fourth and fifth rays longest and produced somewhat beyond the straight terminal margin of the fin; each caudal lobe about 1.33 in head; middle ray 1.55 in head; longest dorsal ray 1.75 in head; longest anal ray 1.7 in head; these longest dorsal and anal rays are posterior to middle of body which gives the fish an ovate outline. Developed scales about seventy, strongly ctenoid on body, and vertical fins and on both sides of fish. Scales of

the eyed side of head ctenoid, those of other side, when present, merely ciliated; opercle and posterior and inferior borders of preopercle scaleless, except about three rows on upper posterior edge of opercle; head everywhere on eyed side thickly covered with fine pale cilia; lower lip with a fringe of large cilia; blind side of head in front with low, strongly ciliated folds or flaps; numerous fine cilia everywhere on the eyed side, anteriorly some of them black, more numerous on the rays of the fins; on blind side cilia are not so numerous on body, groups of them are arranged along the lateral line.

Color on eyed side, dark gray, body crossed by faint, fine, hardly distinguishable dusky lines; vertical fins and caudal gradually darker toward margin, with a narrow pale margin; blind side of head and body white.

This specimen agrees closely with *A. mazatlanus*, differing only in the form of the caudal, which is slightly lunate. This character alone and in but one specimen is scarcely sufficient to justify the description of a new species.

Achirus klunzingeri (STEINDACHNER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2697.
Solea klunzingeri STEINDACHNER, Denk. K. Ak. Wiss. Wien, 1880, **42**, p. 96, pl. 9, fig. 3.

No. 3138, a specimen $5\frac{5}{8}$ inches long from Panama.

Dorsal 61; anal 46; ventral 5; pectoral 6.

Achirus fonsecensis (GÜNTHER).

JORDAN & EVERMANN, Bull. 47, U. S. Nat. Mus., 1898, pt. 3, p. 2699.
Solea fonsecensis GÜNTHER, Cat., 1862, **4**, p. 475.

No. 3139, a specimen $7\frac{1}{2}$ inches long from Panama.

Dorsal 58; anal 42; ventral 5; pectoral 3, much shorter than eye.

Symphurus atramentatus JORDAN & BOLLMAN.

Proc. U. S. Nat. Mus., 1890, **12**, p. 177. SNODGRASS & HELLER, Proc. Wash. Acad. Sci., 1905, **6**, p. 423.

Plate 8, fig. 3.

One specimen 1.62 inches long from Station 4640, Lat. 0°, 39.4′ N.; Long. 88°, 11′ W., taken at surface. This Station is near Galapagos Islands. We provisionally identify the specimen with this species. The identification is not at all certain and is made solely because the species has been recorded from the Galapagos and because it agrees very well in vertical fin rays, the dorsal having 100 and anal 80 rays.

It is a larval form without color-markings; the eye has apparently just

begun its migration from the right to the left side, and what appears to be a yolk-sac is not absorbed. It would almost seem that such a large larval form must be abnormal.

BALISTIDAE.

Balistes capistratus Shaw.

Gen. Zool., 1804, **5**, p. 417. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1704.

One specimen, No. 3322, $10\frac{3}{4}$ inches long from Acapulco has the following counts: — Orbit 4.29 in snout; D. III–31; A. 29; scales 57.

Another specimen, No. 3323, $6\frac{7}{8}$ inches long from the same locality has orbit 3.27 in snout; D. III–31; A. 28; scales 65.

One specimen, No. 3116, M. C. Z. 29716, $13\frac{3}{4}$ inches long from Perico Island, Bay of Panama:

Head from upper end of gill-opening to tip of snout including upper lip, 2.89 in length, not including upper lip 3.08; snout measured from orbit not including upper lip 1.28 in head; orbit 4.62 in snout; dorsal III–31; anal 29; scales from upper end of gill-opening to scale ending on caudal 53; transverse scales from front of anal to front of dorsal 38, counting upward and backward to middle of soft dorsal 29.

Another specimen, No. 3117, M. C. Z. 29628, $9\frac{3}{4}$ inches long from Perico Island:

Head including upper lip 2.76 in length, not including upper lip 3; snout without upper lip 1.40 in head; orbit 5.68 in snout; D. III–32; A. 29; scales in longitudinal series 64; in transverse series, from front of anal to front of dorsal 39.

One specimen, No. 3129, M. C. Z. 29661, $10\frac{1}{8}$ inches long from Toboguilla Island, Bay of Panama has orbit in snout 4.30; D. III–30; A. 28; scales 64.

Another specimen, No. 3131, $8\frac{1}{2}$ inches long from Toboguilla Island, has orbit 3.53 in snout; D. III–31; A. 28; scales in longitudinal series 58.

A third specimen, No. 3130, $7\frac{1}{4}$ inches long from Toboguilla Island, has orbit 3.45 in snout; D. III–32; A. 28; scales 64.

A fourth specimen $4\frac{5}{8}$ inches long from Toboguilla Island, among coral in two fathoms of water, has D. 31; A. 29; scales 63. M. C. Z. 29557 (1 specimen).

No. 3116 from Perico Island and No. 3322 from Acapulco have the band encircling the snout very distinct; in the other specimens it is faded.

Balistes naufragium Jordan & Starks.

Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 488.

One specimen, No. 3115, 9 inches long, from Perico Island, Panama Bay.

D. III–26; A. 24; scales 50.

Canthidermis angulosus (Quoy & Gaimard).

?Snodgrass & Heller, Proc. Wash. Acad. Sci., 1905, **6**, p. 407.
Balistes angulosus Quoy & Gaimard, Voy. Uranie. Zool., 1824, p. 210.

One specimen $\frac{27}{32}$ inches long from Station 4619, Lat. 7°, 15′ N.; Long. 82°, 8′ W.

D. III–21; A. 20; scales about 45.

Color dark brown, small pale white spots scattered over body; pectoral yellowish; dorsal and anal yellowish with dark brown base; caudal pale yellowish.

Two specimens $\frac{7}{16}$ and $\frac{19}{32}$ inches long from Station 4619, Lat. 7°, 15′ N.; Long. 82°, 8′ W. M. C. Z. 29586 (2 specimens).

One specimen $1\frac{5}{16}$ inches long from Station 4594, Lat. 17°, 20′ N.; Long. 101°, 32′ W.

Balistes adspersus Tschudi (Fauna Peruana, Icthyology, 1845, p. 31) is probably this species.

Xanthichthys lineopunctatus (Holland).

Jordan & Evermann, Bull. U. S. Fish. Comm., 1903, **23**, p. 416, fig. 182.
Balistes lineopunctatus Holland, Ann. Sci. Nat., 1854, ser. 4, **1**, p. 65.

Three specimens, Nos. 3175–77, respectively $5\frac{3}{8}$, $6\frac{3}{4}$ and $7\frac{1}{8}$ inches long, and another $7\frac{3}{4}$ inches long, from Cook Bay, Easter Island. M. C. Z. 29374 (1 specimen).

The specimen $7\frac{3}{4}$ inches long was taken in fourteen fathoms of water.

No. 3175, M. C. Z. 29627, has 30 dorsal rays; 27 anal rays; 50 scales in longitudinal series and 23 in transverse series counted from front of anal to first dorsal.

No. 3176 has 30 dorsal rays and 28 anal rays.

No. 3177 has 29 dorsal rays and 26 anal rays.

MONACANTHIDAE.

Monacanthus cirrhifer Temminck & Schlegel.

Temminck & Schlegel, Fauna Japonica, 1850, p. 290, pl. 130, fig. 1.

No. 3199, a specimen $6\frac{5}{8}$ inches long from Cook Bay, Easter Island.

This specimen agrees fairly well with the description and figure of this species given by Temminck & Schlegel (*loc. cit.*) and by Jordan and Fowler, Proc. U. S. Nat. Mus., **25**, p. 264.

Head 3 in length; depth from front of dorsal to tip of ventral spine 1.72,

from soft dorsal to front of anal 2.26; snout 1.17 in head; orbit 4.6; dorsal spine 2.3, and reaching half way from its base to soft dorsal; dorsal I, 35; anal 32.

Color dark brown with very faint traces of cross-bars; dorsal spine banded; soft dorsal and anal yellowish; caudal darker than body; broad bars across chin, throat and snout.

OSTRACIIDAE.

Ostracion tuberculatum Linné.

Syst. Nat. ed. 10, 1758, p. 331. Jordan & Seale, Bull. U. S. Bur. Fish., 1905, **25**, p. 367.

Two specimens 5 and $5\frac{11}{16}$ inches long from Manga Reva. M. C. Z. 29696 (1 specimen).

TETRAODONTIDAE.

Spheroides angusticeps (Jenyns).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1731.
Tetrodon angusticeps Jenyns, Zool. Voy. Beagle. Fish, 1842, pt. 4, p. 154, pl. 28.

Two examples, No. 3251, 3252, M. C. Z. 29664, respectively 12 and $10\frac{1}{8}$ inches long from Wreck Bay, Chatham Island.

Spheroides lobatus (Steindachner).

Jordan, Proc. Cal. Acad. Sci., 1895, ser. 2, **5**, p. 490.
Canthogaster ? lobatus Steindachner, Sitzb. Ak. Wiss. Wien, 1870, **61**, p. 18, pl. 5, fig. 3.

One specimen $2\frac{5}{8}$ inches long from Toboguilla Island, two fathoms of water among coral.

Spheroides annulatus (Jenyns).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1735.
Tetrodon annulatus Jenyns, Zool. Voy. Beagle. Fish, 1842, pt. 4, p. 153.

One specimen $8\frac{1}{2}$ inches long, off Perico Island, Panama Bay in six feet of water.

Three specimens, No. 3208–3210, M. C. Z. 29657, respectively $11\frac{3}{4}$, $8\frac{1}{8}$ and 12 inches long from Wreck Bay, Chatham Island.

Spheroides formosus (Günther).

Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1736.
Tetrodon formosus Günther, Cat., 1870, **8**, p. 283.

One specimen 9 inches long from Panama Bay.

Two specimens $1\frac{1}{16}$ and $9\frac{1}{2}$ inches long from off Perico Island, in six feet of water. M. C. Z. 29693 (1 specimen).

Tetraodon hispidus Linné.

Syst. Nat., ed. 10, 1758, p. 333. Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 159.

No. 3120, a specimen $12\frac{1}{2}$ inches long from Naos Island, Panama Bay.

Tetraodon setosus Rosa Smith.

Bull. Cal. Acad. Sci., 1886, **2**, p. 6. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1739.

Five specimens, No. 3334, M. C. Z. 29653, 3357–9, and 3388, M. C. Z. 29656, respectively $9\frac{1}{2}$, 10, 10, $11\frac{1}{2}$, and $8\frac{1}{4}$ inches long from Acapulco.

Nos. 3357–9, are dark with numerous light spots over the entire head and body and the fins, except in No. 3357; all the fins have a rather broad margin of yellowish, which shows no spots on the outer half of pectoral. Nos. 3334 and 3388 are yellow with a few scattered small black spots, caudal, dorsal, and pectoral with a dusky appearance; No. 3388 is somewhat blotched with black back of the pectoral fin.

Canthigaster solandri (Richardson).

Jordan & Seale, Bull. U. S. Bur. Fish., 1906, **25**, p. 371.
Tetraodon solandri Richardson, Zool. Voy. Sulphur. Ichth., 1845, p. 125, pl. 57, figs. 4–6.

One specimen 3 inches long from Manga Reva, coral.

Eumycterias punctatissimus (Günther).

Gilbert & Starks, Mem. Cal. Acad. Sci., 1904, **4**, p. 160, pl. 23, fig. 46.
Tetrodon punctatissimus Günther, Cat., 1870, **8**, p. 302.

Four specimens 2 to $2\frac{3}{8}$ inches long from Toboguilla Island, in two fathoms, coral.

One specimen $2\frac{3}{4}$ inches long from Acapulco.

One specimen $1\frac{7}{8}$ inches long from Chatham Island, shore. M. C. Z. 29548.

Three specimens $\frac{3}{4}$ to 1 inch long from Perico Island tide pool. M. C. Z. 29371 (2 specimens).

In the specimens from Perico Island, the black ocellus with light margin below the dorsal shows plainly.

DIODONTIDAE.

Diodon hystrix Linné.

Syst. Nat. ed. 10, 1758, p. 335. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1745.

One specimen $\frac{17}{16}$ inches long, from Station 4605, Lat. 12°, 21′ N.; Long. 92°, 13′ W.

Diodon holacanthus Linné.

Syst. Nat. ed. 10, 1758, p. 335. Jordan & Evermann, Bull. 47, U. S. Nat. Mus., 1898, pt. 2, p. 1746.

One specimen $6\frac{1}{2}$ inches long from Panama Bay.

DISTRIBUTION OF THE SPECIES.

	Coast of Mexico.	Coast of Central America.	Galapagos Islands.	Off coast of Peru.	Between Callao, Peru and Easter Island.	Between Galapagos Islands and Easter Island.	Easter Island.	Between Galapagos Islands and Manga Reva.	Manga Reva.	Between Manga Reva and Acapulco.
Raja aguja				+						
Urolophus halleri	+									
" aspidurus		+								
" rogersi	+									
Sardinella thrissina	+	+								
Opisthopterus dovii		+								
Anchovia opercularis		+								
" macrolepidota		+								
" ischana	+									
Qassiremus evionthas			+							
Muraena clepsydra		+								
" lentiginosa	+						+			
Gymnothorax dovii										
Uropterygius necturus	+									
Sciadeichthys troscheli		+								
Poecilia sphenops		+								
Tylosurus stolzmanni			+							
Scombresox sp.	+			+		+				
Hyporhamphus unifasciatus	+									
" roberti	+									
Hemiramphus saltator	+									
Exocoetus volitans		+	+			+		+		
Cypsilurus poecilopterus					+					
" sp.		+								
Fodiator acutus	+									
?Exonautes sp.		+	+							+
Kirtlandia gilberti		+								
Mugil hospes	+									
Chaenomugil proboscideus	+	+	+							
Neomyxus ciliilabis									+	
" chaptalii			+							
Sphyraena idiastes			+							
Polydactylus approximans		+								
" opercularis		+								
Siphostoma californiensis	+									
Myripristis occidentalis	+	+								
" microphthalmus									+	
" pralinius							+			
" multiradiatus									+	
" sealei			+							
Holocentrus suborbitalis	+	+	+							
" punctatissimus							+			
" diadema									+	
" sammara									+	
" opercularis									+	

DISTRIBUTION OF THE SPECIES—Continued.

	Coast of Mexico.	Coast of Central America.	Galapagos Islands.	Off coast of Peru.	Between Callao, and Easter Island. Peru	Between Galapagos Islands and Easter Islands.	Easter Island.	Between Galapagos Islands and Manga Reva.	Manga Reva.	Between Manga Reva and Acapulco.
Scomberomorus sierra		+								
Naucrates ductor						+				
Platystethus cultratus							+			
Decapterus sanctae-helenae							+			
Hemicaranx atrimanus		+								
" zelotes		+								
" leucurus		+								
Caranx hippos		+								
" caballus		+								
" marginatus	+	+								
" guara							+			
Vomer setapinnis		+								
Chloroscombrus orqueta		+								
Trachinotus rhodopus	+	+								
Nomeus gronovii										+
Coryphaena hippurus		+								
Coryphaena equisetis		+						+		
Centropomus robalito		+								
Amia exostigma									+	
" savayensis									+	
" erythrina									+	
" doryssa									+	
" dovii		+								
" atradorsata			+							
" retrosella	+									
Fowleria isostigma									+	
Paramia lineatus									+	
Kuhlia nutabunda							+			
" sandvicensis									+	
Acanthistius cinctus							+			
Trachypoma macracanthum							+			
Petrometopon panamensis	+	+								
Epinephelus analogus		+								
labriformis	+	+	+							
merra									+	
socialis									+	
Dermatolepis punctatus	+									
Prionodes fasciatus	+									
Paranthias furcifer		+								
Rhegma thaumasium		+								
Lobotes pacificus	+									
Hoplopagrus guentheri	+									
Lutianus argentiventris	+	+								
guttatus	+	+								
aratus		+								
marginatus									+	
Rabirubia inermis	+									
Xenocys jessiae			+							
Xenichthys xanti		+								
agassizii			+							

DISTRIBUTION OF THE SPECIES — Continued.

	Coast of Mexico.	Coast of Central America.	Galapagos Islands.	Off coast of Peru.	Between Callao, Peru and Easter Island.	Between Galapagos Islands and Easter Islands.	Easter Island.	Between Galapagos Islands and Manga Reva.	Manga Reva.	Between Manga Reva and Acapulco.
Caesio tile									+	
Haemulon sexfasciatum	+									
scudderi	+	+								
steindachneri	+	+								
Lythrulon flaviguttatum	+	+								
Orthostoechus maculicauda	+									
Anisotremus interruptus	+									
caesius	+									
surinamensis	+		+							
Orthopristis chalceus		+								
Gnathodentex aureolineatus									+	
Lethrinus rostratus									+	
Eucinostomus californiensis	+	+	+							
Xystaema cinereum	+									
Gerres peruvianus		+								
Doydixodon freminvillei			+							
Kyphosus elegans	+	+								
cinerascens							+			
Girella nebulosa							+			
Upeneus xanthogrammus	+									
Pseudupeneus multifasciatus							+			
Mulloides auriflamma									+	
samoensis									+	
rathbuni	+									
Isopisthus remifer		+								
Corvula macrops	+									
Ophioscion perissa			+							
Micropogon altipinnis		+								
Polyclemus goodei		+								
Eques fuscovittatus	+									
Azurina upalama			+							
Pomacentrus rectifraenum	+	+								
gilli	+	+								
arcifrons			+							
flavilatus	+	+								
jenkinsi							+			
leucorus			+							
Abudefduf sordidus									+	
septemfasciatus									+	
saxatilis	+	+	+							
declivifrons	+	+								
glaucus									+	
Dascyllus aruanus									+	
Chromis caeruleus									+	
atrilobatus	+	+								
Microspathodon dorsalis	+		+							
Bodianus diplotaenius		+								
eclancheri			+							
Pseudolabrus inscriptus							+			

DISTRIBUTION OF THE SPECIES — Continued.

	Coast of Mexico.	Coast of Central America.	Galapagos Islands.	Off coast of Peru.	Between Callao, Peru and Easter Island.	Between Galapagos Islands and Easter Island.	Easter Island.	Between Galapagos Islands and Manga Reva.	Manga Reva.	Between Manga Reva and Acapulco.
Halichoeres sellifer	+									
dispilus	+									
Pseudojulis notospilus	+	+								
Cheilio inermis							+			
Thalassoma duperry	+	+								
purpureum			+							
umbrostigma							+			
lucasanum	+	+								
Cheilinus undulatus									+	
Callyodon perrico		+								
noyesi			+							
Chaetodon nigrirostris	+	+								
humeralis	+	+								
lineolatus									+	
trifasciatus									+	
Heniochus monoceros									+	
Pomacanthus zonipectus		+								
Holacanthus passer	+	+	+							
Teuthis triostegus									+	
" umbra							+			
Ctenochaetus striatus									+	
Zebrasoma veliferum									+	
Xesurus punctatus	+									
clarionis			+							
Siganus rostratus									+	
Sebastopsis xyris			+							
Scorpaena mystes	+		+							
?Scorpaena histrio			+							
Dormitator maculatus		+								
Gymneleotris seminudus	+									
Gobius rhizophora			+							
gilberti			+							
Mapo soporator		+	+						+	
Kelloggella oligolepis							+			
Gobiosoma crescentale			+							
Gillelus rubellulus			+							
Dactyloscopus pectoralis			+							
Enneanectes carminalis	+									
Malacoctenus delalandii	+	+								
zonogaster			+							
Labrisomus jenkinsi			+							
Mnierpes macrocephalus	+									
Auchenopterus monophthalmus		+								
?Emnion bristolae	+									
Runula azalea	+		+							
Dialommus fuscus		+	+							
Enneapterygius corallicola			+							
Alticus atlanticus			+							
striatus							+			

DISTRIBUTION OF THE SPECIES—Concluded.

	Coast of Mexico.	Coast of Central America.	Galapagos Islands.	Off coast of Peru.	Between Callao, Peru and Easter Island.	Between Galapagos Islands and Easter Island.	Easter Island.	Between Galapagos Islands and Manga Reva.	Manga Reva.	Between Manga Reva and Acapulco.
Alticus periophthalmus									+	
variolosus							+			
biseriatus									+	
Salarias lineatus									+	
edentulus									+	
Ogilbia ventralis	+									
Petrotyx hopkinsi			+							
Batrachoides pacifici		+								
Gobiesox erythrops			+							
Arbaciosa truncata			+							
zebra		+								
Echeneis remora						+				
Platophrys constellatus									+	
?Platophrys leopardinus	+	+	+			+				
Achirus mazatlanus		+								
klunzingeri		+								
fonsecensis		+								
Symphurus atramentatus			+							
Balistes capistratus	+	+								
naufragium		+								
Canthidermis angulosus	+	+								
Xanthichthys lineopunctatus							+			
Monacanthus cirrhifer							+			
Ostracion tuberculatum									+	
Spheroides angusticeps			+							
lobatus		+								
annulatus		+	+							
formosus			+							
Tetraodon hispidus			+							
setosus		+								
Canthigaster solandri									+	
Eumycterias punctatissimus	+	+	+							
Diodon hystrix	+									
holacanthus		+								

DESCRIPTION OF THE PLATES.

Plate 1.

Figs. 1, 2. Raja aguja Kendall and Radcliffe, page 78.

Plate 2.

Fig. 1. Myripristis occidentalis (Gill), page 90.
Fig. 2. Holocentrus suborbitalis Gill, page 94.
Fig. 3. Platystethus cultratus (Bloch and Schneider), page 97.

Plate 3.

Fig. 1. Kuhlia mutabunda Kendall and Radcliffe, page 105.
Fig. 2. Girella nebulosa Kendall and Radcliffe, page 120.

Plate 4.

Fig. 1. Girella nebulosa Kendall and Radcliffe, page 120.
Fig. 2. Girella nebulosa Kendall and Radcliffe, page 120.
Fig. 3. Ophioscion perissa (Heller and Snodgrass), page 125.

Plate 5.

Fig. 1. Eques fuscovittatus Kendall and Radcliffe, page 125.
Fig. 2. Pseudolabrus inscriptus (Richardson), page 137.

Plate 6.

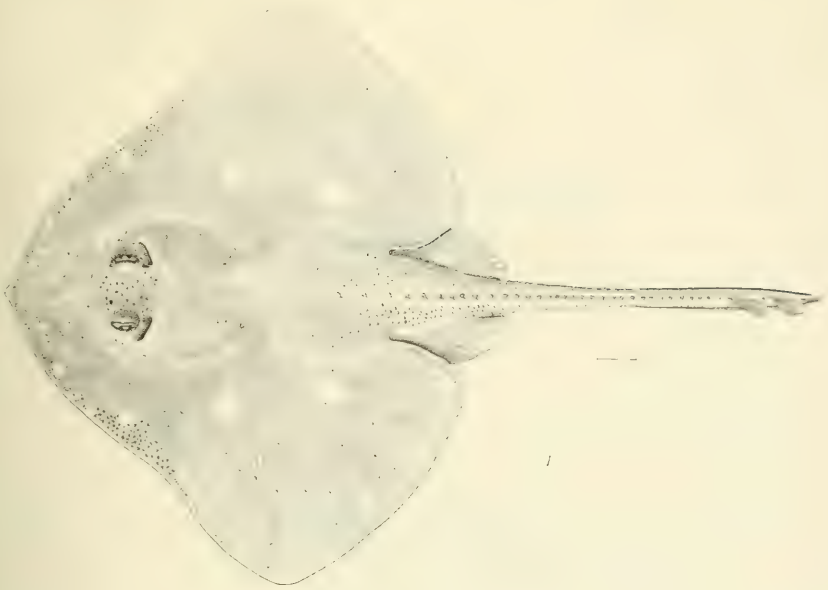
Fig. 1. Pseudolabrus inscriptus (Richardson), page 137.
Fig. 2. Pseudojulis notospilus Günther, page 139.
Fig. 3. Gillelus rubellulus Kendall and Radcliffe, page 148.

Plate 7.

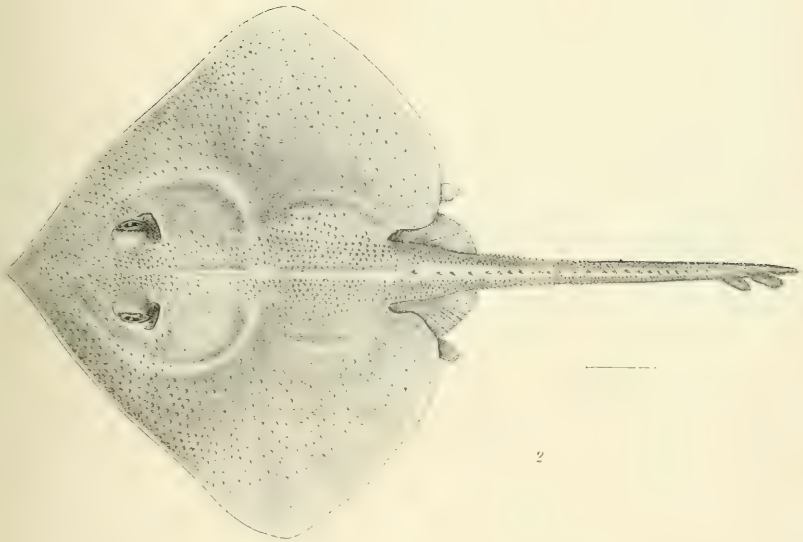
Fig. 1. Enneapterygius corallicola Kendall and Radcliffe, page 153.
Fig. 2. Alticus biseriatus (Cuvier and Valenciennes), page 156.
Fig. 3. Alticus margaritatus Kendall and Radcliffe, ♂, page 157.

Plate 8.

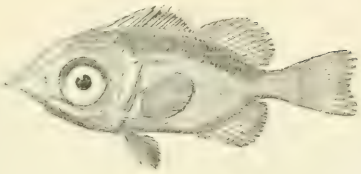
Fig. 1. Alticus margaritatus Kendall and Radcliffe, ♀, page 157.
Fig. 2. ? Platophrys leopardinus (Günther), page 160.
Fig. 3. Symphurus atramentatus Jordan and Bollman, page 162.



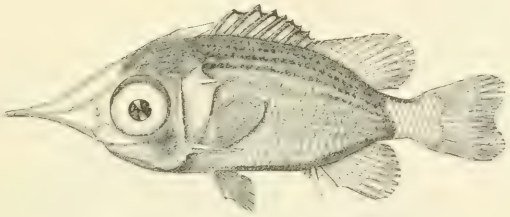
1



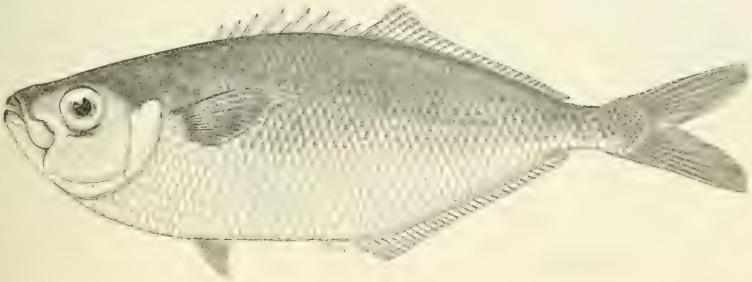
2



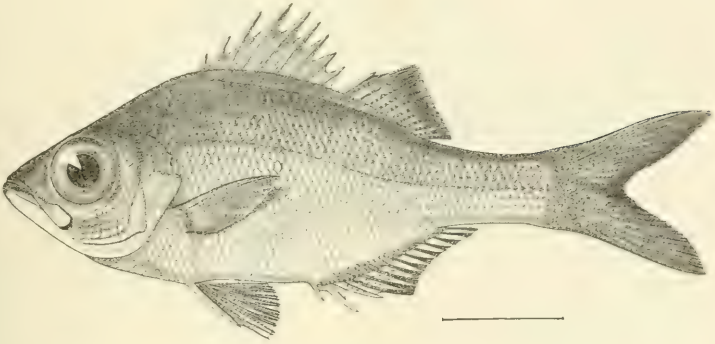
1 ½ in

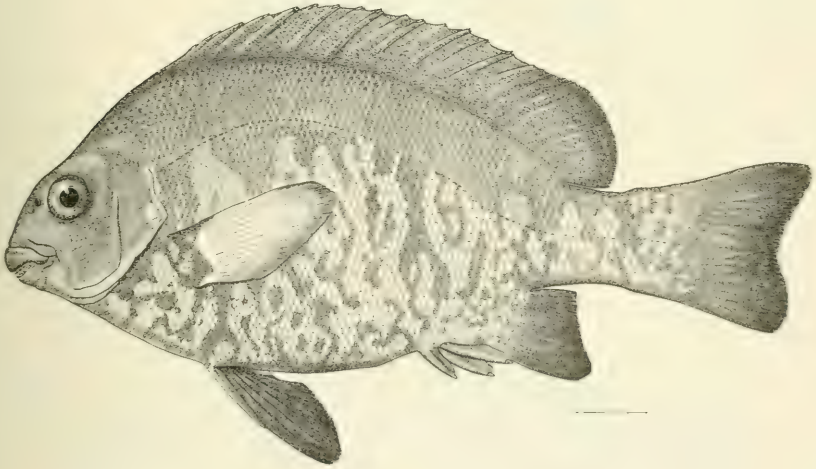


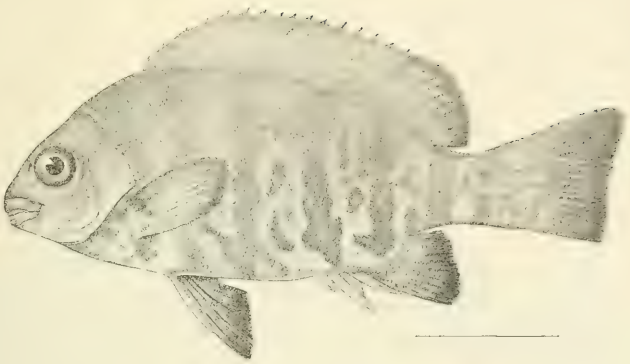
2 ½ in

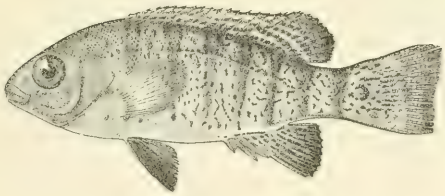


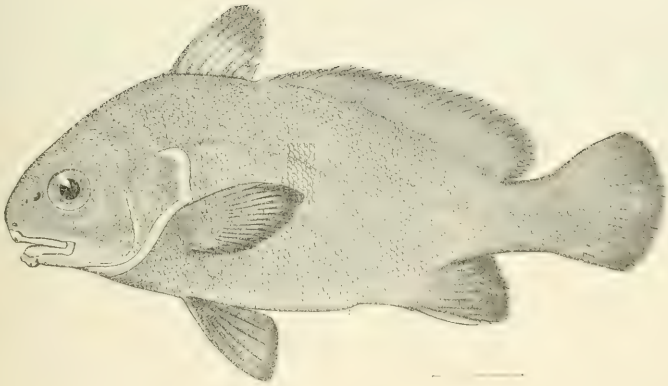
3



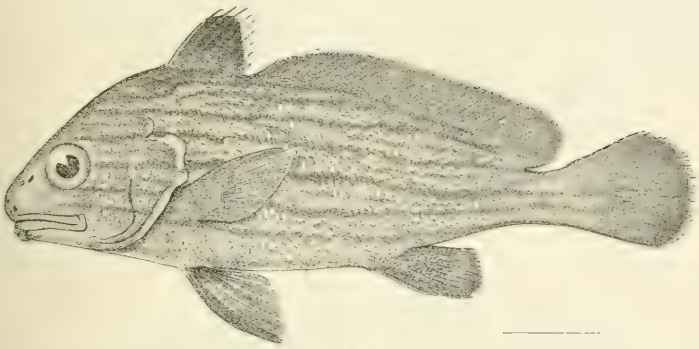


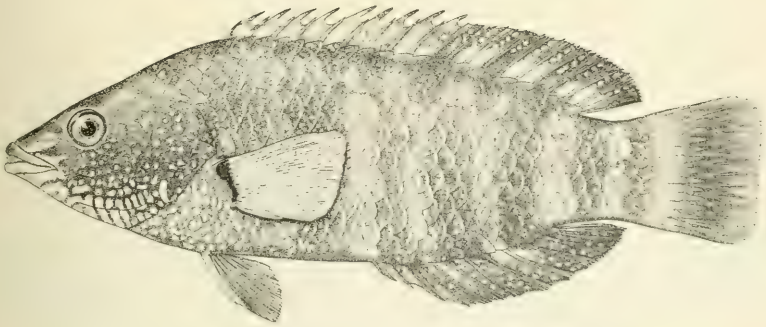


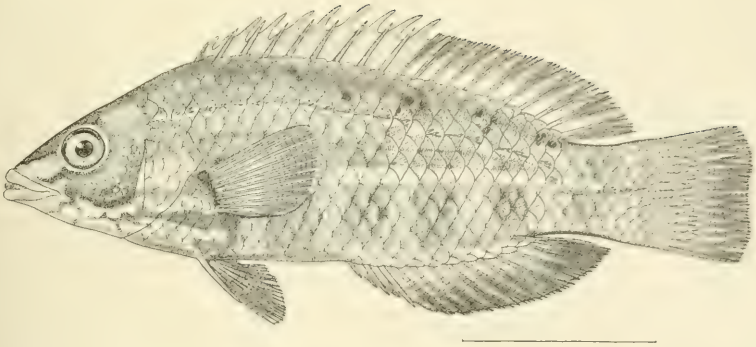




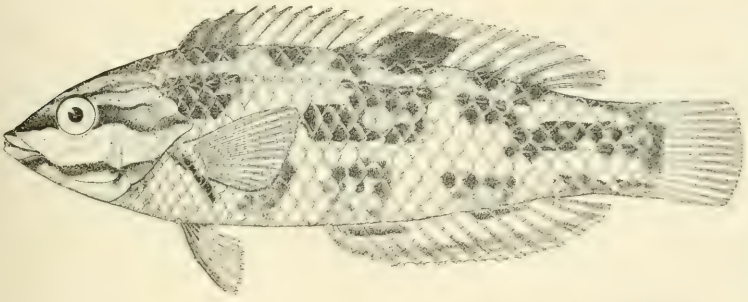
Bell, Typ. C. Boston



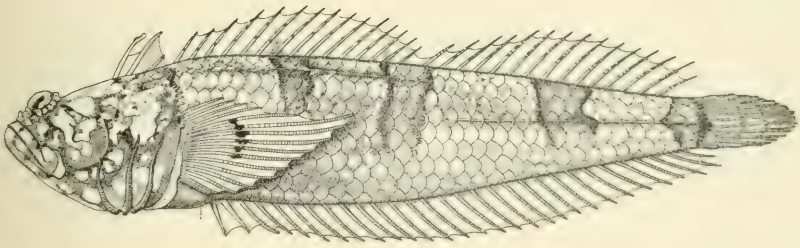




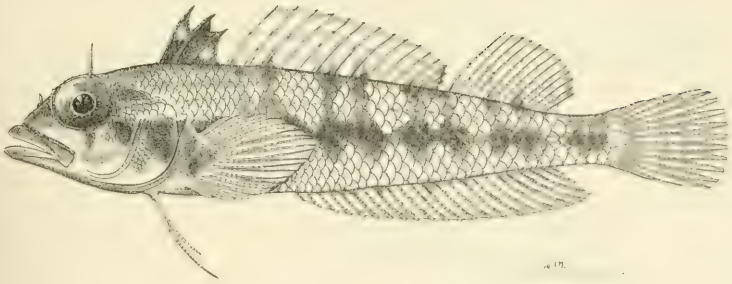
1



2

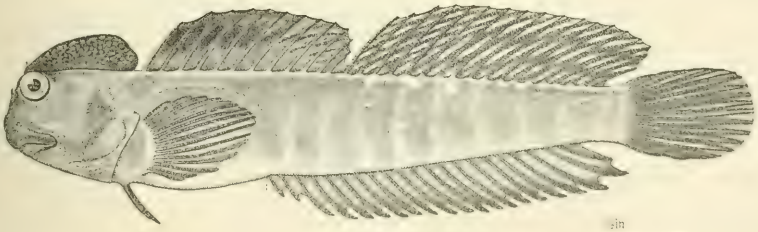


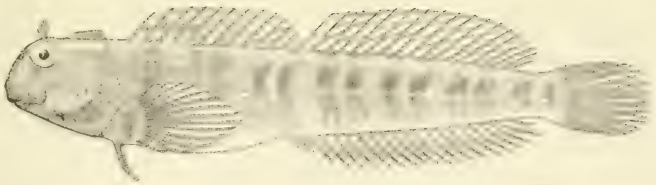
3

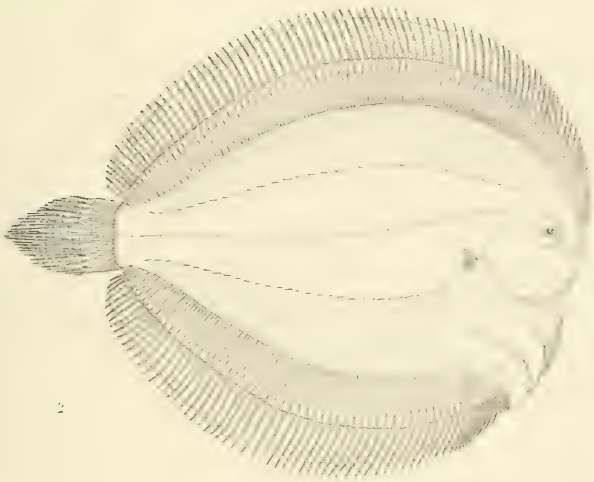


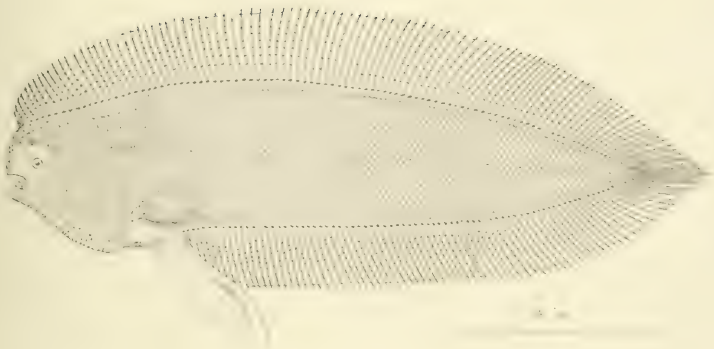
1

2









Memoirs of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE
Vol. XXXV. No. 4.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO MARCH, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING.

XVI.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE EASTERN TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM OCTOBER, 1904, TO MARCH, 1905, LIEUT. COMMANDER L. M. GARRETT, U. S. N., COMMANDING.

XXVII.

THE SCHIZOPODA.

By H. J. HANSEN.

WITH TWELVE PLATES.

[Published by permission of George M. Bowers, U. S. Commissioner of Fish and Fisheries.]

CAMBRIDGE, U.S.A.:
Printed for the Museum.
July, 1912.

TABLE OF CONTENTS.

	Page
Introductory Remarks	177
Mysidacea	
Lophogastrida	
Chalaraspis Willemoës Suhm.	181
Chalaraspis alata G. O. Sars, Pl. 1, figs. 1a–1l	182
Gnathophausia Willemoës-Suhm	184
Gnathophausia ingens (Dohrn)	184
Gnathophausia gracilis Willemoës-Suhm	185
Gnathophausia zorea Willemoës-Suhm	186
Eucopia Dana	187
Eucopia unguiculata Willemoës-Suhm	187
Eucopia major H. J. Hansen	188
Eucopia sculpticauda Faxon	189
Mysida	
Boreomysis G. O. Sars	
Boreomysis media, sp. nov., Pl. 1, figs. 2a–2b	190
Boreomysis fragilis, sp. nov., Pl. 1, fig. 3a; Pl. 2, fig. 1a	191
Siriella Dana	192
Siriella thompsonii (H. Milne Edwards)	192
Siriella gracilis Dana	193
Siriella media H. J. Hansen	194
Siriella aequiremis H. J. Hansen	194
Hemisiriella H. J. Hansen	
Hemisiriella abbreviata, sp. nov., Pl. 2, figs. 2a–2c	195
Anchialina Norman	196
Anchialina typica (Kröyer)	196
Anchialina grossa H. J. Hansen	196
Anchialina obtusifrons, sp. nov., Pl. 2, figs. 4a–4c	197
Gastrosaccus Norman	198
Gastrosaccus pacificus, sp. nov., Pl. 2, figs. 3a–3g	198
Euchaetomera G. O. Sars	199
Euchaetomera typicus G. O. S., Pl. 2, figs. 5a–5c	199
Euchaetomera tenuis G. O. Sars	201
Euchaetomera plebeja, sp. nov., Pl. 3, figs. 1a–1b	202
Cryptomysis, gen. nov.	203
Cryptomysis lamellicauda, sp. nov., Pl. 3, figs. 2a–2m.	204
Doxomysis, gen. nov.	205
Doxomysis pelagica, sp. nov., Pl. 3, figs. 3a–3g	205
Euphausiacea	206
Bentheuphausia G. O. Sars	206
Bentheuphausia amblyops G. O. Sars	206
Thysanopoda H. Milne Edwards	207
Thysanopoda tricuspidata H. Milne Edwards, Pl. 4, fig. 2a	208
Thysanopoda cristata G. O. Sars, Pl. 3, figs. 4a–4c; Pl. 4, figs. 1a–1h	209
Thysanopoda monacantha Ortmann, Pl. 4, figs. 3a–3c	212
Thysanopoda aequalis H. J. Hansen, Pl. 4, fig. 4a	214
Thysanopoda obtusifrons G. O. Sars, Pl. 4, figs. 5a–5f	215
Thysanopoda pectinata Ortmann, Pl. 5, figs. 1a–1m	218
Thysanopoda orientalis H. J. Hansen, Pl. 5, figs. 2a–2i	222
Thysanopoda cornuta Illig	223
Thysanopoda? cornuta Illig., Juv., Pl. 6, figs. 1a–1e	224
Thysanopoda egregia H. J. Hansen	225
Nyctiphanes G. O. Sars	226
Nyctiphanes simplex H. J. Hansen, Pl. 6, figs. 2a–2i; Pl. 7, figs. 1a–1b	227
Euphausia Dana	230
Euphausia eximia H. J. Hansen, Pl. 7, figs. 2a–2g	230
Euphausia recurva H. J. Hansen, Pl. 7, figs. 3a–3n	233

	Page
Euphausia diomedea Ortmann, Pl. 7, fig. 4a	235
Euphausia mutica H. J. Hansen	237
Euphausia brevis H. J. Hansen, Pl. 8, figs. 1a–1g	239
Euphausia pacifica H. J. Hansen, Pl. 7, figs. 5a–5b	241
Euphausia tenera H. J. Hansen	242
Euphausia gibba G. O. Sars, Pl. 8, figs. 2a–2b	244
Euphausia paragibba H. J. Hansen	246
Euphausia pseudogibba Ortmann	247
Euphausia distinguenda H. J. Hansen, Pl. 8, figs. 3a–3f	248
Euphausia lamellifera H. J. Hansen, Pl. 8, figs. 4a–4e; Pl. 9, fig. 1a	250
Euphausia gibboides Ortmann, Pl. 9, figs. 2a–2h	252
Euphausia mucronata G. O. Sars, Pl. 9, figs. 3a–3g	255
Pseudeuphausia H. J. Hansen	257
Pseudeuphausia latifrons G. O. Sars	257
Nematoscelis G. O. Sars	258
Nematoscelis microps G. O. Sars, Pl. 9, figs. 4a–4d; Pl. 10, figs. 1a–1b	259
Nematoscelis gracilis H. J. Hansen, Pl. 10, fig. 2a	261
Nematoscelis tenella G. O. Sars, Pl. 10, figs. 3a–3c	263
Nematobrachion Calman	264
Nematobrachion boopis Calman, Pl. 10, figs. 4a–4d	267
Nematobrachion flexipes Ortmann, Pl. 10, figs. 5a–5m	269
Nematobrachion sexspinosus H. J. Hansen, Pl. 10, fig. 6a; Pl. 11, figs. 1a–1i	272
Stylocheiron G. O. Sars	273
Stylocheiron carinatum G. O. Sars, Pl. 11, figs. 2a–2b	274
Stylocheiron microphthalma H. J. Hansen	277
Stylocheiron suhmii G. O. Sars, Pl. 11, figs. 3a–3b	277
Stylocheiron affine H. J. Hansen	278
Stylocheiron longicorne G. O. Sars, Pl. 11, figs. 4a–4b	279
Stylocheiron elongatum G. O. Sars	280
Stylocheiron abbreviatum G. O. Sars, Pl. 11, figs. 5a–5f	280
Stylocheiron maximum H. J. Hansen	283
Larval stages of Euphausiacea, Pl. 12	283
Thysanopoda sp. (T. monacantha aff.) Pl. 12, figs. 1a–1g	284
Euphausia distinguenda H. J. Hansen, Pl. 12, figs. 2a–2c	287
Nyctiphanes simplex H. J. Hansen, Pl. 12, figs. 3a–3f	288
Pseudeuphausia latifrons G. O. Sars, Pl. 12, figs. 4a–4b	290
Nematoscelis microps G. O. Sars, Pl. 12, figs. 5a–5c	291
Stylocheiron carinatum G. O. Sars, Pl. 12, figs. 6a–6d	293
The distribution of the Euphausiacea	295
Explanation of the Plates	

INTRODUCTORY REMARKS.

The collection dealt with in the present paper is extremely large, both as to the number of species, sixty-three, and especially as to the numbers of the specimens of the major part of the forms. A small portion of the material was captured by the late Alexander Agassiz near the Fiji Islands in 1897, a still smaller lot was secured during the trip of the "Albatross" in 1899–1900, but the vast majority has been collected by Dr. Agassiz in 1904–1905 in the Eastern Pacific. When we wish to get a closer insight into the whole topic it is, however, necessary to consider separately the two orders still not infrequently united under the name Schizopoda, viz. Mysidacea and Euphausiacea. And a comparison with the results of the exploration of the Dutch "Siboga" Expedition in the Indian Archipelago is interesting.

Of the order Mysidacea only twenty-three species are at hand, fifteen of which were secured in 1904–1905, while the remaining eight forms were exclusively gathered during the earlier trips just mentioned. Fifteen species in all from the Expedition in 1904–1905 is in reality a small number as compared with the number of species already known of this order. But the explanation of this fact is given below, and when we consider the order Euphausiacea the aspect is quite different. Of the last-named order the collection contains forty species, all with a single exception taken in 1904–1905 (some among them besides in 1899–1900 or off the Fiji Islands), but as only seventy-three species of this order are known from all seas, it will be seen that Dr. Agassiz during that single Expedition captured more than half of the world's fauna. The "Siboga" gathered only twenty-five species of Euphausiacea but no less than forty-seven species of Mysidacea. The explanation of this startling difference between the results of the Agassiz Expedition of 1904–1905 and the "Siboga" Cruise is that the Euphausiacea are nearly all true oceanic forms, while the majority of the Mysidacea either inhabit shallow water, or live pelagically, or not far from the bottom to a few hundred fathoms and within no very great distance from land. And while the "Siboga" in the main explored the straits and comparatively

smaller seas between the innumerable islands in the Indian Archipelago, the Agassiz Expedition of 1904–1905 had the great majority of its Stations in the open ocean and far from any coast.

On the Mysidacea at hand some remarks may be added. The eight species not captured in 1904–1905 are small, pelagic forms taken near, or at most only some miles from the coast; four among them are new, and one of these differs so much from earlier known forms that it was necessary to establish a new genus for its reception. Of the fifteen species taken in 1904–1905 four are new; three of these belong to well-known genera, while a new genus is established for the fourth. But by far the most important gain was the capture of *Chalaraspis alata* (Will.-Suhm, MS.) G. O. Sars. This genus as defined by Sars with its single species has been described by him from a couple of sketches drawn by Willemoës-Suhm during the "Challenger" Expedition, as the single specimen had been lost. The genus belongs to the interesting suborder Lophogastrida, comprising in all only six genera; the Agassiz Expedition secured some specimens of Chalaraspis, and among them an adult male, thus rendering it possible to give a detailed account of this hitherto rather enigmatic type.

The material of Euphausiacea is, as already stated, very rich, and besides it is important in various respects. Among its forty species six could not be referred to earlier established forms, but in a paper published in May, 1911,[1] I have given preliminary descriptions of these, and other, new species. Perhaps one might expect that the number of undescribed species had been considerably higher, but in the years 1905–1910 I had established a comparatively large number of species of this order on animals from the Atlantic or the Indian Archipelago; the major part of the species of the order have a very large or frequently even vast distribution, and consequently more than three fourths of the Euphausiacea from the East Pacific were known before from the Indian Archipelago ("Siboga") or from the Atlantic, or from both Oceans. But the collection made it possible to extend our knowledge of the distribution of the major part of the species very much; furthermore, as the material, of nearly all the new species, and besides of several earlier established but hitherto imperfectly known species, is rich and generally well preserved, it was possible to give a full account of these forms. And without entering into other points elucidated by the collection, for instance, the distribution of many of the species within the area explored, geographical variation of some forms, etc., another

[1] H. J. Hansen: The Genera and Species of the Order Euphausiacea, with Account of remarkable Variation. Bull. Mus. Océan. Monaco, No. 210.

consideration ought to be pointed out. In the Synopsis mentioned (1911) I set forth several reasons for the belief "that comparatively few, probably not a dozen, species in the oceans of the globe are still undiscovered." And if that view be correct it must be admitted that the results of the Agassiz exploration in 1904–1905 are as to this order of Crustacea wonderfully rich, because during that trip thirty-nine species were collected, thus a little more than half of the species hitherto known — and not far from half of the species really existing!—The collection contains besides a large number of larvae, of Euphausiacea, but on this topic it may be sufficient to refer to my remarks in the chapter on the larval stages (p. 283–294).

As to the classification of the Mysidacea and some characters in the Euphausiacea — especially the important copulatory organs of first pair of pleopods in the male — I may refer to the account in my paper on the "Siboga" Schizopoda frequently quoted on the following pages. Only a few points may be added. Recently I found that in some genera (Thysanopoda, Nematoscelis, and Nematobrachion) the maxillulae afford valuable specific characters or characters for groups of species belonging to the same genus, furthermore that in a few genera the maxillae show specific differences of some interest, finally that in the genus Nematoscelis the thoracic legs afford excellent characters for dividing the genus into two natural groups.— The nomenclature of the cephalothoracic appendages in the two orders is identical with that applied in the "Siboga" paper.

The geographical distribution of each species is mentioned. I have attempted in all cases to give a full abstract of all trustworthy statements in the literature, but as to several species of various genera (Euphausia, Nematoscelis, Stylocheiron) most of the earlier statements had to be discarded as the species in question were "collective." I have added a good many statements based on the material of the Copenhagen Museum, but do not think it well to insert still unpublished results based on collections to be reported on in the near future, namely those from the Swedish Antarctic Expedition, from the U. S. National Museum, etc.

And now I may express my deep regret that Dr. A. Agassiz did not live to see the publication of this paper, because it would certainly have been a satisfaction for that great explorer to see how rich his collection of these groups of Crustacea and especially of the oceanic Euphausiacea in reality was and how important it proved for the advancement of this branch of zoölogical science.

Finally I desire to render my sincere thanks to the authorities of the Museum of Comparative Zoölogy for their friendliness, and especially for allowing me to employ my two very able countrymen, Mr. T. N. Möller, the engraver, and Mr. J. Bech, the copper-plate printer, for the reproduction of my drawings.

Copenhagen, Sept. 18, 1911.

THE SCHIZOPODA.

I. The Order MYSIDACEA.

A. Suborder LOPHOGASTRIDA.

CHALARASPIS Willemoës-Suhm (1875).

Description.— Integument soft. Carapace thin, submembranaceous, without processes, anteriorly produced as a very broad but somewhat short frontal plate (Plate 1, fig. 1a), and with the postero-lateral rounded wings reaching to the end of the thorax or a little more backwards; the cervical groove very strong.

Eyes small, light reddish. Antennular peduncles (figs. 1a–1b) short and extremely thick; inner flagellum thin, about as long as the peduncle.— Antennal squama not jointed, with the outer margin serrate beyond the middle (fig. 1c).— Maxillulae (fig. 1e) without palp and without setae or spines on the inner lobe.— Maxillae (fig. 1f) somewhat reduced; the lobe from second (l^2) and third (l^3) joint distally rounded, undivided; the palp (p) very short, unjointed, and scarcely marked off; the exopod strongly developed, very broad.— Maxillipeds (fig. 1g) with the exopod about as long as the endopod, which distally is a little broader than in Lophogaster.

Gnathopods slightly shorter than the following pair of legs, shaped as in Lophogaster, with the seventh joint somewhat thick, a little curved, distally rounded, and strongly setose.— Legs somewhat slender, and the last pair (fig. 1i) considerably thinner than the first (fig. 1h) or second pair; claw long or very long, thin; exopod well developed in all pairs (the ovigerous female is unknown).

Sixth abdominal segment with two pairs of acute teeth from the lateral margin (fig. 1k), but the segment is not divided into two sections by any suture. Uropods with the endopod slightly overreaching the telson and a little longer than the exopod, which is not jointed towards the end (fig. 1l). Telson (fig. 1l) oblong-triangular, with the narrow end truncate, with lateral spines, and a couple of dorsal keels.

Remarks.— This genus is perhaps more allied and similar to Lophogaster M. Sars than to any other genus of the suborder; from the genus named it is, however, easily distinguished by the shape of the frontal plate, the reduced eyes, the less developed maxillae, the long uropods, etc. As to the use of the

name Chalaraspis I follow Sars (Challenger Rept., p. 51). Willemoës-Suhm left two figures of a species to which he had given the name *Chalaraspis alata*. The only specimen obtained by the "Challenger" had been lost, and therefore Sars described the genus and the species from the drawings made by Suhm. The drawings have been rendered as woodcuts by Sars; they were evidently somewhat imperfect or inaccurate in several particulars. The figures show the animal as having the carapace exceedingly large, covering the two anterior abdominal segments and the lateral part of third segment. Among the "Albatross" material I found specimens agreeing tolerably with Suhm's figures in all main features excepting the relative length of the carapace, but as specimens of allied genera, Gnathophausia and Eucopia, sometimes are contracted to such a degree that the carapace covers two segments of the abdomen, no stress can be laid on the apparently very long carapace shown by Suhm's drawings, as his specimen in all probability has been very much contracted. And Sars's diagnosis of the genus agrees, so far as it goes, in the main with the description founded on my specimens.

1. **Chalaraspis alata** Willemoës-Suhm, MS. G. O. Sars.

Plate 1, figs. 1a–1l.

1885. *Chalaraspis alata* G. O. Sars, Challenger Rept., **13**, p. 51. (Two text-figures).

Sta. 4665. Nov. 17, 1904. Lat. 11° 45′ S., long. 86° 5.2′ W. 300 fms. to surface. 1 very young specimen.

Sta. 4672. Nov. 21, 1904. Lat. 13° 11.6′ S., long. 78° 18.3′ W. Top of Tanner net, 400 fms. to surface. 2 immature specimens (bad).

Sta. 4675. Nov. 22, 1904. Lat. 12° 54′ S., long. 78° 33′ W. 300 fms. to surface. 1 immature specimen.

Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 1 male.

Description.— General aspect somewhat similar to that of Lophogaster.— The frontal plate somewhat short but very broad, with the anterior transverse margin straight or even slightly emarginate and the lateral angles broadly rounded (figs. 1a–1b). The carapace has the cervical groove not only deep but very curiously shaped; seen from the side (fig. 1b) the groove seems to be formed by two transverse furrows which unite laterally, while the anterior furrow is again dorsally bifid; on the side the furrow is bent and is far from reaching the lower margin of the carapace. A little more than the anterior fourth of the lateral margin of the carapace is hollowed in a peculiar way, and somewhat above the whole lateral margin a furrow runs from near the front to the hind margin. Between the antero-lateral rounded angles of the frontal plate and the cervical groove a pair of feeble longitudinal keels are seen (fig. 1a), and the area between these keels is feebly concave; a branchial groove is feebly developed, and rarely the posterior third of the carapace has the middle line

distinctly keeled. The postero-lateral part of the carapace at each side is somewhat produced backwards and rounded as in Eucopia.

The eyes (fig. 1b, o.) are small, a little compressed, seen from above (fig. 1a) oblique-ovate, light reddish.— The antennular peduncles short and extremely thick; second joint with an oblong, slender, moderately short process on the outer side; third joint with the front margin projecting in an oblong, very acute process above the insertion of the upper flagellum and a somewhat similar process more downwards on the inner side of the joint; the upper flagellum thin, with numerous joints and about as long as the peduncle; lower flagellum very strong.— Last joint of the antennal peduncle with a small process on the outer side just below the insertion of the squama; the squama itself is a thin plate reaching somewhat beyond the end of the antennular peduncle, it is somewhat more than twice as long as broad (fig. 1c) with the inner margin very convex and setose, the outer margin a little bent angularly near or a little beyond the middle and its proximal part glabrous, the distal part serrate with 9–12 acute saw-teeth somewhat different in size.

The five anterior abdominal segments somewhat thick, dorsally flatly convex, and some among them even with a small, a little excavated dorsal area; lateral plates of the anterior segments rounded, on fifth, and sometimes on fourth, segment the postero-lateral angle is produced in a tiny or small, acute tooth. Sixth segment about as long as the fifth, with two pairs of obliquely transverse, somewhat short and shallow furrows; the two pairs of lateral teeth very acute. The uropods (fig. 1l) with the endopods slightly overreaching the telson and a little longer than the exopod, which has the end truncate and three or four faint serrations along the outer margin. Telson (fig. 1l) very oblong-triangular, scarcely three times as long as broad, above with a pair of high, longitudinal, very feebly serrate keels a little from the lateral margins, and the area between these keels excavated longitudinally; the distal half of each lateral margin with 5 or 6 spines; the end of the telson truncate, but hairs or spines wanting — perhaps lost?— in the specimens.

Length of the largest specimen, a probably adult male, 35 mm.

Remarks.— I do not entertain the slightest doubt that the species described here is *C. alata*. And I think it very important that it has been possible to fill the gap in our knowledge of the only hitherto imperfectly studied genus of the small but highly interesting suborder Lophogastrida.

Distribution.— The "Challenger" specimen was taken in the South Pacific: "lat. 50° 1′ S., long. 123° 4′ E.; depth, 1800 fathoms." It is certainly a bathypelagic form.

GNATHOPHAUSIA Willemoës-Suhm (1875).

The material is scanty, consisting of seven specimens belonging to three well-known species.

2. **Gnathophausia ingens** (Dohrn).

1870. *Lophogaster ingens* Dohrn, Zeitschr. wiss. Zool., **20**, p. 610; taf. 31, figs. 12–14.
1885. *Gnathophausia ingens* G. O. Sars, Challenger Rept., **13**, p. 30, pl. 2.
—— *Gnathophausia calcarata* G. O. Sars, Challenger Rept., **13**, p. 35, pl. 4.
1891. *Gnathophausia bengalensis* Wood-Mason, Ann. Mag. Nat. Hist., ser. 6, **8**, p. 269.
1906. *Gnathophausia ingens* Ortmann, Proc. U. S. Nat. Mus., **31**, p. 28.
—— *Gnathophausia calcarata* Ortmann, Proc. U. S. Nat. Mus., **31**, p. 30, pl. 1, figs. 2a, 2b.

Sta. 3681. Aug. 27, 1899. Lat. 28° 23′ N., long. 126° 57′ W. 350 fms. to surface. 1 specimen.

Remarks.— The specimen, which measures about 68 mm., agrees well with Ortmann's description of *G. calcarata* G. O. S. Dr. A. Alcock kindly sent me Wood-Mason's type of *G. bengalensis* and I can confirm Ortmann's interpretation that it is identical with *G. calcarata*. Wood-Mason said that "the upper lateral keels are strongly roof-shaped," but Ortmann was unable to understand the meaning of this sentence; I suppose, however, that Wood-Mason intended to say that the keels in question protrude laterally as eaves above the vertical sides of the carapace, when this is seen from behind or in an optic transverse section.

Ortmann (l. c., p. 28–30 and p. 34) was of the opinion that *G. ingens* (Dohrn) G. O. Sars, is the full-grown female of *G. calcarata* (Will.-Suhm, MS.) G. O. S., and I am able to add three points corroborating his view. I examined Sars's "Challenger" specimens of *G. ingens* (Dohrn) in the British Museum and found that it possessed the two pairs of oblique keels on the upper surface of the carapace, these keels being even well developed and completely similar to those on the type of *G. calcarata*; Ortmann rightly supposed that these keels had been overlooked by Dohrn and Sars. Furthermore Sars's figure of the ventral epimeral plates of the sixth abdominal segment in *G. ingens* is incorrect; the slit between the two posterior lobes of the plate is longer and narrower in proportion to the breadth of the lobes than in his fig. 6 (Pl. II), and, what is of more importance, each lobe has its outer terminal angle produced into a somewhat short, pointed tip, while the inner terminal angle at the slit is acute but very slightly produced, thus situated somewhat in front of the outer tip and shaped about as in *G. calcarata*, but differing notably from Sars's fig. 6 of *G. ingens*. Finally Sars says in the diagnosis of *G. ingens*: "branchiostegal spines obsolete," but he overlooked that these spines had been broken off in his specimen. I think one is now justified in adopting Ortmann's supposition and may safely take the step to withdraw *G. calcarata*, considering it only as a synonym.

Distribution.— According to the literature this species is known from off the West coast of Africa, "Laos," from the Gulf of Mexico, the Bay of Bengal, the Arafura Sea, South of Mindanao, the Hawaiian Islands, and is common in the California region in the East Pacific.

3. **Gnathophausia gracilis** Willemoës-Suhm.

1875. *Gnathophausia gracilis* Willemoës-Suhm, Trans. Linn. Soc. London, ser. 2, **1**, p. 33, pl. 9, fig. 1.
1885. *Gnathophausia gracilis* G. O. Sars, Challenger Rept., **13**, p. 48, pl. 7, figs. 6–10.
1891. *Gnathophausia brevispinis* Wood-Mason & Alcock, Ann. Mag. Nat. Hist., ser. 6, **7**, p. 269.
1895. *Gnathophausia brevispinis* Faxon, Mem. Mus. Comp. Zoöl., **18**, p. 216, pl. J.
1906. *Gnathophausia gracilis* Ortmann, Proc. U. S. Nat. Mus., **31**, p. 39.

Sta. 4651. Nov. 11, 1904. Lat. 5° 47.1′ S., long. 82° 59.7′ W. 2222 fms., trawl. 1 specimen.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. 400 fms. to surface. 1 small specimen.
Sta. 4656. Nov. 13, 1904. Lat. 6° 51.6′ S., long. 83° 34.3′ W. 2222 fms., trawl. 1 specimen.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 2035 fms., trawl. 1 specimen.
Sta. 4715. Jan. 2, 1905. Lat. 2° 40.4′ S., long. 90° 19.3′ W. On way up from 1743 fms. 1 specimen.

Remarks.— The largest specimen, a male from Sta. 4709, is 69 mm. long; a female with the marsupium well developed (from Sta. 4656) is 65 mm. long, and another female with marsupium (from Sta. 4715) is 62 mm. These three large specimens have on the gastric area an oblong, rather high, lamellar, subtriangular, dentate crest terminating in a spiniform process; besides they have the lateral plates of the five anterior abdominal segments expanded posteriorly; the expansion of the plates of first segment is small in the two females, moderately large in the male, and the expansions increase in all three specimens gradually and considerably in size from first to fourth segment, while those of the fifth segment are somewhat smaller. In the smallest specimen, measuring 25 mm., the anterior dorsal spine on first abdominal segment is extremely small, the lateral plates of the abdominal segments are not expanded posteriorly, and the lamellar crest on the gastric area is rudimentary with a small spine above; in the fifth specimen, which is 37 mm. long, the last-named lamellar crest is developed nearly as in the large specimens, but the lateral plates of the second to the fifth abdominal segments are very feebly expanded.

I have examined the type-specimen of Willemoës-Suhm and G. O. Sars; it measures 41 mm. and is preserved in the British Museum. It has on the gastric region a small, oblong, triangular, lamellar plate with a spine on the vertex and a little farther behind there are four small saw-like teeth in a longitudinal row; furthermore the lateral plates of the abdominal segments are feebly expanded nearly as in the above mentioned specimen measuring 37 mm. Dr. Alcock loaned me the type of *G. brevispinis*, and an examination gave the

result that it is identical with *G. gracilis* Will.-Suhm, as already pointed out by Ortmann.

Ortmann's elaborate account of this characteristic species is very good; my own examination of the types corroborates his statements and critical remarks. The study of the five specimens from the Agassiz collection and the two types mentioned shows that the lamellar crest is well developed both in full-grown and a little more than half-grown specimens, but rudimentary in a much smaller specimen, while the expansion of the lateral plates of the five abdominal segments is well developed only in full-grown specimens and feebly developed in specimens measuring 37–41 mm. in length. It may be added that the anterior dorsal spiniform process on first abdominal segment is always much smaller than the posterior, but proportionately considerably longer in large than in small specimens. The character pointed out by Ortmann that "there are two triangular, pointed epimeral lappets on each side of the anterior part of the sixth segment" is very interesting.

Distribution.— According to the literature this species has a wide distribution:— Atlantic at Lat. 1° 22′ N., long. 26° 36′ W., Bay of Bengal, off Galapagos, off Panama, and off Central California. It is a bathypelagic species, taken in depths from more than 600 to more than 2000 fathoms to surface, the only exception being the small, not half grown specimen from Sta. 4652 taken in 400 fathoms to surface.

4. **Gnathophausia zoëa** Willemoës-Suhm.

1875. *Gnathophausia zoëa* Willemoës-Suhm, Trans. Linn. Soc. London, ser. 2, **1**, p. 32, pl. 9, figs. 2–15; pl. 10, fig. 4.
1885. *Gnathophausia zoëa* G. O. Sars, Challenger Rept., **13**, p. 44, pl. 6, figs. 6–10.
—— *Gnathophausia willemoesii* G. O. Sars, Challenger Rept., **13**, p. 38, pl. 5, figs. 1–6.
1891. *Gnathophausia sarsi* Wood-Mason and Alcock, Ann. Mag. Nat. Hist., ser. 6, **7**, p. 187.
1906. *Gnathophausia zoëa* Ortmann, Proc. U. S. Nat. Mus., **21**, p. 42.
1908. *Gnathophausia zoëa* H. J. Hansen, The Danish Ingolf-Exp., **3**, 2, p. 93, pl. 4, figs. 3a–3c.
1910. *Gnathophausia zoëa* H. J. Hansen, Siboga-Exp., **37**, p. 17.

Sta. 4641. Nov. 7, 1904. Lat. 1° 34.4′ S., long. 89° 30.2′ W. 633 fms., trawl. 1 specimen.

Remarks.— As to variation, size, etc., of this species I refer to Ortmann's paper and to the remarks in my two recent treatises. The specimen from the Agassiz Expedition is about half grown and shows nothing of interest.

Distribution.— This species is common in the tropical and northern temperate Atlantic, where it is found northwards even to West of Iceland: Lat. 64° 45′ N., long. 29° 06′ W. (Ingolf-Exp.); it has been taken in the Bay of Bengal, in the Indian Archipelago, and is widely distributed in the tropical and northern temperate Pacific. Detailed statements on the geographical and bathymetrical occurrence are found in Ortmann's paper and in my two recent reports.

EUCOPIA Dana (1852).

The genus comprises four species, three of which are represented in this collection. In the account of the "Siboga" Schizopoda I have given an analytical key to the species and have dealt with the synonymy.

5. **Eucopia unguiculata** (Willemoës-Suhm).

1875. *Chalaraspis unguiculata* Willemoës-Suhm, Trans. Linn. Soc. London, ser. 2, **1**, p. 37–40, pl. 8 (partim).
1905. *Eucopia unguiculata* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 3.
1910. *Eucopia unguiculata* H. J. Hansen, Siboga-Exp., **37**, p. 20, pl. 1, fig. 3a.

In this list I do not include Sars's account of his *Eucopia australis* Dana in the "Challenger" Rept., p. 55, pls. 9–10, because he, as pointed out in the "Siboga" paper, has confused three species, viz. *E. australis* Dana with figs. 1–2 on his pl. 9, *E. sculpticauda* Faxon, to which his figures 13–17 on pl. 10 belong, and *E. unguiculata* Will.-Suhm, to which at least the majority of his other figures belong.

Sta. 4646. Nov. 8, 1904. Lat. 4° 1.6′ S., long. 89° 16.3′ W. 300 fms. to surface. 1 specimen.
Sta. 4650. Nov. 10, 1904. Lat. 5° 22′ S., long. 84° 39′ W. 300 fms. to surface. 1 specimen.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. 400 fms. to surface. 1 specimen.
Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. 400 fms. to surface. 1 specimen.
Sta. 4664. Nov. 17, 1904. Lat. 11° 30.3′ S., long. 87° 19′ W. 300 fms. to surface. 1 specimen.
Sta. 4667. Nov. 18, 1904. Lat. 11° 59.5′ S., long. 83° 40.4′ W. 300 fms. to surface. 5 specimens.
Sta. 4668. Nov. 19, 1904. Lat. 12° 9.3′ S., long. 81° 45.2′ W. Bottom of Tanner net, 300 fms. 1 specimen.
Sta. 4669. Nov. 19, 1904. Lat. 12° 12.7′ S., long. 80° 25.6′ W. 300 fms. to surface. 6 specimens.
Sta. 4671. Nov. 20, 1904. Lat. 12° 6.9′ S., long. 78° 28.2′ W. 300 fms. to surface. 8 specimens.
Sta. 4672. Nov. 21, 1904. Lat. 13° 11.6′ S., long. 78° 18.3′ W. 400 fms. to surface, Tanner net, closed bottom. 1 specimen.
Sta. 4676. Dec. 5, 1904. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 3 specimens.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. 600 fms. to surface. 1 specimen.

Remarks.— The largest specimen, an adult male from Sta. 4676, measures 33 mm. in length, and is thus uncommonly large; the largest female with marsupium, from Sta. 4655, is 32 mm. long.

Distribution.— The species is common in the Western Mediterranean and the northern temperate Atlantic and extends far northwards, as it has been taken in the Davis Straits at Lat. 61° 50′ N. and West of Iceland at Lat. 64° 38′ N., long. 32° 37′ W. (Ingolf-Exp.). It is known from some localities in the Indian Archipelago; as shown above, it is not uncommon in a good portion South of Lat. 4° S. of the area explored in 1904–1905, and it is probably widely distributed in the tropical and temperate Pacific; Ortmann (1906) records a specimen from

North Coronado Island, California. Its distribution southward in the three large Oceans is still unknown. The majority of the localities enumerated in the literature by the authors until July 1905 for *E. australis* Dana certainly belong to *E. unguiculata*, but some among them to *E. major* or *E. australis*, and all specimens referred before July 1895 to *E. australis* should be reëxamined. The real *E. australis* Dana is a very large Antarctic species. The species has, as far as I know, never been taken near the surface.

6. **Eucopia major** H. J. Hansen.

1910. *Eucopia major* H. J. Hansen, Siboga-Exp., **37**, p. 21, pl. 1, figs. 4a–4b.

Sta. 4645. Nov. 8, 1904. Lat. 3 °37.6′ S., long. 89° 43.1′ W. 1955 fms., trawl. 1 specimen (only a fragment).
Sta. 4651. Nov. 11, 1904. Lat. 5° 41.7′ S., long. 82° 59.7′ W. 2222 fms., trawl. 2 specimens.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 2320 fms., trawl. 1 specimen.

Remarks.— This species was established on a badly preserved female with marsupium secured by the "Siboga" and measuring 42 mm. in length. The specimens from the Pacific are also badly preserved; a male, from Sta. 4651, is 58 mm. long, and a female, from Sta. 4742, with the marsupial plates perhaps not fully developed is even about 60.5 mm. But I am inclined to think that these specimens had been a little shorter in the living state than in their present bad and seemingly extended condition.

The species is easily separated from *E. unguiculata* by its much larger size, the largest specimen recorded of the last-named species was only 38 mm., and especially by having its short eyes looking forwards, occupying less than one fourth of the outer margin of the whole appendage (stalk + cornea), while in *E. unguiculata* the cornea looks in the main outwards and occupies more than one third, frequently about two fifths, of the same outer margin. *E. major* is readily distinguished from *E. australis* Dana by having the terminal joint of the exopod of the uropods distinctly broader than long, while in *E. australis* it is longer than broad; besides the eye-stalks are proportionately longer and narrower in *E. australis* than in *E. major*.

Distribution.— A single specimen was captured in the Indian Archipelago by the "Siboga," and in 1910 some specimens were secured by the Prince of Monaco in the Atlantic West of Southern Spain. In 1906 Ortmann enumerated six localities in the North Pacific northwards to Lat. 56° 12′ N. and one locality in the West Indies for *E. australis*, but as *E. australis* Dana is an Antarctic species his determinations cannot be correct. As he had separated *E. unguiculata* from his *E. australis* I think that the specimens from his seven

localities belong either all to *E. major* or some to *E. major* and others either to a hitherto undescribed species or that they are young specimens of *E. sculpticauda* Faxon.

7. **Eucopia sculpticauda** Faxon.

1893. *Eucopia sculpticauda* Faxon, Bull. Mus. Comp. Zoöl., **24**, p. 218.
1895. *Eucopia sculpticauda* Faxon, Mem. Mus. Comp. Zoöl., **18**, p. 219, pl. K, figs. 2, 2d; pl. 53, figs. 1–1d.
1905. *Eucopia intermedia* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 30, p. 5, figs. 2–3. (Young).
1905. *Eucopia sculpticauda* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 30, p. 6–7; fig. 4.

Sta. 4645. Nov. 8, 1904. Lat. 3° 37.6′ S., long. 89° 43.1′ W. 1955 fms., trawl. 1 adult female.
Sta. 4648. Nov. 9, 1904. Lat. 4° 43′ S., long. 87° 7.5′ W. 300 fms. to surface. 1 young specimen.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. 400 fms. to surface. 4 specimens (1 female with marsupium, 3 young specimens).
Sta. 4657. Nov. 13, 1904. Lat. 7° 12.5′ S., long. 84° 9′ W. 300 fms. to surface. 2 young specimens.
Sta. 4664. Nov. 17, 1904. Lat. 11° 30.3′ S., long. 87° 19′ W. 300 fms. to surface. 2 young specimens.
Sta. 4667. Nov. 18, 1904. Lat. 11° 59.5′ S., long. 83° 40.4′ W. 300 fms. to surface. 1 young specimen.
Sta. 4676. Dec. 5, 1904. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 1 young specimen.
Sta. 4715. Jan. 2, 1905. Lat. 2° 20.4′ S., long. 90° 19.3′ W. 300 fms. to surface. 1 young specimen.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 2084 fms., trawl. 2 adult females.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 1841 fms., trawl. 1 adult female.

Remarks.— As already mentioned in the "Siboga" paper *E. intermedia* is only the young, differing from large or adult specimens in having the telson scarcely or not at all constricted a little before the tip and without any network of ridges on a portion of its surface, furthermore by having the first pair of thoracic legs somewhat less thick than in the adult, but yet much thicker than in the three other species of the genus.

As seen in the list, five females with marsupium have been captured. The smallest female (from Sta. 4652) is only 30 mm. long, the largest (from Sta. 4724) is 49 mm., the three other respectively 31.6 mm., 34.5 mm. and 36.5 mm. Faxon has mentioned a female measuring 66 mm. in length.

Distribution.— Faxon established *E. sculpticauda* on some specimens from the tropical Pacific (the Galapagos, the Gulf of Panama, off Central America); Ortmann (1905) enumerated two specimens from the Hawaiian Islands. It has been taken by the "Investigator" in the Bay of Bengal, by the Prince of Monaco in various places within the triangular area between Gibraltar, the Azores, and the Canary Islands; finally West of the Hebrides and Southwest of Iceland at Lat. 62° 25′ N., long. 28° 30′ W. (Ingolf-Exp.).

It is interesting that all the specimens captured by the "Albatross" at the six Stations in depths from 300 fms. to surface are not full grown, while one adult female is from 400 fms. to surface and the four other adult females from much greater depths to surface. This seems to confirm my observations

as to *Gnathophausia zoëa* Will.-Suhm, *Sergestes arcticus* Kr., and *Sergestes robustus* Smith, "that small specimens are often at least found nearer the surface than the larger and that the wholly developed specimens are always only met with in deeper layers."

B. Suborder **MYSIDA.**

BOREOMYSIS G. O. Sars (1869).

8. **Boreomysis media,** sp. nov.

Plate 1, figs. 2a–2b.

Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. 400 fms. to surface. 1 adult female (Type).
Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. 400 fms. to surface. 1 adult female.
Sta. 4675. Nov. 22, 1904. Lat. 12° 54′ S., long. 78° 33′ W. 300 fms. to surface. 1 adult female.

Description.— Frontal plate very considerably produced (fig. 2a), with the transition between the front margin and the oblique lateral margin considerably curved; the front margin is produced in a conspicuous, triangular, acute rostrum. Eyes of very moderate size, brownish, somewhat depressed, scarcely as broad as the end of the stalk, which is a little broader than long and with a triangular process of moderate size on the upper surface. The antennal squama somewhat short, only three times as long as broad, with the outer margin nearly straight, the inner considerably convex and the end scarcely more than half as broad as the squama a little behind the middle; the terminal margin somewhat oblique and the outer tooth very distinct.

Exopod of uropods (fig. 2b) eight times as long as broad, with a couple of spines placed a little beyond the end of the proximal sixth of the outer margin. Telson scarcely three times as long as broad, because its proximal third is very broad; from the end of that third the telson tapers strongly to the beginning of the distal fourth, where it is narrow, only two fifths as broad as at the base; its terminal fourth widens feebly to the end; the incision, which occupies one fifth or one sixth of the whole length, has no angles on its margins and its proximal part is shaped as a triangle with its two sides a little convex. Each lateral margin from the end of the proximal third to near the distal end is furnished with about 10–11 moderately small spines and 18–20 very small spines, the latter regularly arranged between the former and generally two small spines in each interval (fig. 2b, a); along the distal part of the margin the spines are more equal in size, small.

Length of a female with marsupium (from Sta. 4652) 19.5 mm.

Remarks.—This species is allied to *B. sibogae* H. J. H., but differs especially in having the antennal squama conspicuously broader with the end oblique and the inner margin more convex; furthermore, the telson is distally much narrower and the incision conspicuously shorter than in *B. sibogae*.

9. **Boreomysis fragilis,** sp. nov.

Plate 1, fig. 3a; Plate 2, fig. 1a.

Sta. 4650. Nov. 10, 1904. Lat. 5° 22′ S., long. 84° 39′ W. 300 fms. to surface. 3 specimens.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82′ 39.5′ W. 400 fms. to surface. 1 specimen.
Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. 400 fms. to surface. 1 adult female.
Sta. 4671. Nov. 20, 1904. Lat. 12° 6.9′ S., long. 78° 28.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4676. Dec. 5, 1004. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 1 specimen.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 2 adult specimens, male (Type) and female.

Description.— Frontal plate considerably produced, subtriangular (fig. 3a), with the lateral margins very feebly convex and a little concave in front at the rostral process, which is triangular, acute, and bent a little upwards. Eyes very small, reddish brown, looking forwards and especially downwards, only a narrow strip being visible from above; the eye-stalks increase somewhat in breadth from the base outwards and are somewhat longer, measured from the middle of the terminal margin, than broad; at the upper inner angle produced into an oblong-triangular process reaching considerably beyond the cornea.

The antennal squama is somewhat less than four times as long as broad, broadest somewhat before the middle and there almost twice as broad as at the end; the outer margin is feebly concave, the terminal margin oblique, and the outer tooth very distinct.

Exopod of the uropods (fig. 1a) seven times as long as broad, with a couple of fine spines on the outer margin at the end of its naked basal fifth. Telson proportionately broad, scarcely more than three times as long as broad, but at the beginning of its terminal fourth only about two fifths as broad at a little from the base; the terminal incision, which occupies about one fifth of the total length, has its proximal portion triangular and a little acuminate, while the major part of the lateral margins of the incision are more or less distinctly diverging. The lateral margins of the telson are furnished with a moderately small number of spines; seven or eight at each side are somewhat small but yet considerably or much longer than the others which are very or extremely small.

In the adult male the exopod of third pair of pleopods is about half as long again, the exopod of second pair about one third as long again, as the endopod.

Length of the male 12 mm., of a female with marsupium 13 mm.

Remarks.— This small species is allied to *B. microps* G. O. Sars, but differs especially in having the process at the end of the eye-stalks very much larger and the longer lateral spines on the telson much shorter than in the last-named species. The integuments are thin; not a single specimen is really well preserved, and the majority a good deal mutilated and somewhat shrivelled; most of them are besides immature or small.

It may be mentioned that a small, oblong ganglion is found at the base of the process on the eye-stalks; this ganglion is connected with the large optic ganglion by a couple of nerve fibres, and from it a fibre runs towards the end of the process, which probably may have some sensory function.

SIRIELLA Dana (1850).

Of this very large genus four species are at hand, three of which were taken in 1904–1905, and a fourth in 1900.

10. **Siriella thompsonii** (H. Milne Edwards).

1837. *Cynthia thompsonii* H. Milne Edwards, Hist. Nat. Crust., **2**, p. 462.
1852. ?*Siriella vitrea* Dana, U. S. Expl. Exp. Crust., **1**, p. 656, pl. 43, figs. 6a–6m.
—— ?*Siriella brevipes* Dana, U. S. Expl. Exp. Crust., **1**, p. 658, pl. 44, figs. 1a–1q.
1861. *Cynthia inermis* Kröyer, Nat. Tidsskr., 3, R. **1**, p. 44, tab. 2, fig. 6, a–g.
1868. *Siriella edwardsii* Claus, Zeitschr. wiss. Zool., **17**, p. 271, taf. 18.
1882. *Siriellides indica* Czerniavsky, Mon. Mysid., **1**, p. 103, tab. 31, figs. 1–6.
1885. *Siriella thompsoni* G. O. Sars, Challenger Rept., **13**, p. 205, pl. 36, figs. 1–24.
1910. *Siriella thompsonii* H. J. Hansen, Siboga-Exp., **37**, p. 31 (with further notes on synonymy).

Sta. 4571.	Oct.	7, 1904.	Lat. 33° 40′ N., long. 119° 35′ W.	4 fms., surface net. 2 specimens.
Sta. 4576.	Oct.	8, 1904.	Lat. 29° 52′ N., long. 116° 56′ W.	Surface. 1 specimen.
Sta. 4611.	Oct.	18, 1904.	Lat. 10° 33′ N., long. 88° 30′ W.	Surface. More than 30 specimens.
Sta. 4615.	Oct.	19, 1904.	Lat. 9° 7′ N., long. 85° 11′ W.	Surface. 2 specimens.
Sta. 4617.	Oct.	20, 1904.	Lat. 7° 45′ N., long. 82° 25′ W.	Surface. 1 specimen.
Sta. 4619.	Oct.	20, 1904.	Lat. 7° 15′ N., long. 82° 8′ W.	Surface. 2 specimens.
Sta. 4635.	Nov.	4, 1904.	Lat. 3° 52.5′ N., long. 84° 14.3′ W.	Surface. 3 specimens.
Sta. 4640.	Nov.	6, 1904.	Lat. 0° 39.4′ S., long. 88° 11′ W.	Surface. 1 specimen.
Sta. 4646.	Nov.	8, 1904.	Lat. 4° 1.6′ S., long. 89° 16.3′ W.	Surface. 1 specimen.
Sta. 4648.	Nov.	9, 1904.	Lat. 4° 43′ S., long. 87° 7.5′ W.	Surface. 1 specimen.
Sta. 4667.	Nov.	18, 1904.	Lat. 11° 59.5′ S., long. 83° 40.4′ W.	Surface. 1 specimen.
Sta. 4671.	Nov.	20, 1904.	Lat. 12° 6.9′ S., long. 78° 28.2′ W.	Surface. 3 specimens.
Sta. 4677.	Dec.	5, 1904.	Lat. 14° 37.5′ S., long. 81° 41′ W.	Surface. 1 specimen.
Sta. 4678.	Dec.	6, 1904.	Lat. 16° 31.2′ S., long. 85° 3.8′ W.	Surface. 1 specimen.
Sta. 4680.	Dec.	7, 1904.	Lat. 17° 55′ S., long. 87° 42′ W.	Surface. 13 specimens.
Sta. 4682.	Dec.	8, 1904.	Lat. 19° 7.6′ S., long. 90° 10.6′ W.	Surface. 2 specimens.
Sta. 4683.	Dec.	9, 1904.	Lat. 20° 2.4′ S., long. 91° 52.5′ W.	300 fms. to surface. 1 specimen.
Sta. 4685.	Dec.	10, 1904.	Lat. 21° 36.2′ S., long. 94° 56′ W.	300 fms. to surface. 2 specimens.
Sta. 4686.	Dec.	10, 1904.	Lat. 22° 2.2′ S., long. 95° 52′ W.	Surface. 2 specimens.
Sta. 4688.	Dec.	11, 1904.	Lat. 23° 17.2′ S., long. 98° 37.5′ W.	Surface. 3 specimens.
Sta. 4692.	Dec.	13, 1904.	Lat. 25° 40.4′ S., long. 101° 1.3′ W.	Surface. 1 specimen.
Sta. 4694.	Dec.	22, 1904.	Lat. 26° 34′ S., long. 108° 57.3′ W.	Surface. 4 specimens.

Sta. 4695.	Dec. 23, 1904.	Lat. 25° 22.4′ S., long. 107° 45′ W. 300 fms. to surface. 2 specimens.
Sta. 4696.	Dec. 23, 1904.	Lat. 24° 40.3′ S., long. 107° 5.3′ W. Surface. 7 specimens.
Sta. 4698.	Dec. 24, 1904.	Lat. 22° 50.4′ S., long. 105° 31.7′ W. Surface. 1 specimen.
Sta. 4700.	Dec. 25, 1904.	Lat. 20° 28.8′ S., long. 103° 26.3′ W. Surface. 5 specimens.
Sta. 4702.	Dec. 26, 1904.	Lat. 18° 39.5′ S., long. 102° W. Surface. 1 specimen.
Sta. 4704.	Dec. 27, 1904.	Lat. 16° 55.3′ S., long. 100° 24.6′ W. Surface. 1 specimen.
Sta. 4706.	Dec. 28, 1904.	Lat. 14° 18.7′ S., long. 98° 45.8′ W. Surface. 1 specimen.
Sta. 4709.	Dec. 30, 1904.	Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4710.	Dec. 30, 1904.	Lat. 9° 30.5′ S., long. 95° 8.3′ W. Surface. 1 specimen.
Sta. 4712.	Dec. 31, 1904.	Lat. 7° 5′ S., long. 93° 35.5′ W. Surface. 11 specimens.
Sta. 4718.	Jan. 13, 1905.	Lat. 5° 32.4′ S., long. 90° 32.2′ W. Surface. 1 specimen.
Sta. 4720.	Jan. 14, 1905.	Lat. 7° 13.3′ S., long. 102° 31.5′ W. Surface. 1 specimen.
Sta. 4723.	Jan. 16, 1905.	Lat. 10° 14.3′ S., long. 107° 45.5′ W. Surface. 14 specimens.
Sta. 4725.	Jan. 17, 1905.	Lat. 11° 38.3′ S., long. 110° 5′ W. Surface. 7 specimens.
Sta. 4727.	Jan. 18, 1905.	Lat. 13° 03′ S., long. 112° 44.9′ W. Surface. 12 specimens.
Sta. 4729.	Jan. 19, 1905.	Lat. 14° 15′ S., long. 115° 13′ W. Surface. 6 specimens.
Sta. 4741.	Feb. 11, 1905.	Lat. 8° 29.7′ S., long. 122° 56′ W. Surface. 1 specimen.

Remarks.— Adult specimens of both sexes vary extremely in length. The smallest female with marsupium (from Sta. 4702) is 4.4 mm. long, another female (from Sta. 4696) scarcely 4.5 mm., while the largest female (from Sta. 4680) is 9.6 mm. from the end of the frontal plate to the tip of the telson. One of the smallest males (from Sta. 4678) is 6.6 mm., and the largest male (from Sta. 4677) is 9.8 mm. The number of spines on the distal part of the outer margin of first joint of the exopod of the uropods varies from 3 to 6.

Three females from Sta. 4727, two from Sta. 4680, and one female from Sta. 4611 and from Sta. 4671, have an Epicarid, probably *Dajus siriellae* G. O. Sars, in the marsupium.

Distribution.— According to the literature and the collections seen by me this species is widely distributed in the tropical and warmer temperate areas of the Atlantic, the Indian Ocean, and the Pacific; the Copenhagen Museum possesses specimens from about fifty places in these Oceans. In the Atlantic it has been taken northwards to Lat. 42° N., long. 44° W., southwards to Lat. 40° 32′ S., long. 52° 2′ W., in the Indian Ocean southwards to Lat. 40° 4′ S., long. 53° 25′ E. (specimens from these three localities in the Copenhagen Museum); in the Pacific it was taken at Lat. 33° 40′ N. in 1904, and southwards it is known from a point between Sidney and Wellington (G. O. Sars). It has generally been captured at the surface; I am even inclined to think that the specimens from the three Stations named above from "300 fms. to surface" were taken near the surface.

11. **Siriella gracilis** Dana.

1852. *Siriella gracilis* Dana, U. S. Expl. Exp. Crust., **1**, p. 658, pl. 44, figs. 1a–1g.
1885. *Siriella gracilis* G. O. Sars, Challenger Rept., **13**, p. 209, pl. 36, figs. 25–28.
1910. *Siriella gracilis* H. J. Hansen, Siboga-Exp., **37**, p. 31.

Sta. 4592. Oct. 13, 1904. Lat. 18° 20′ N., long. 103° 40′ W. Surface. 2 specimens.
Sta. 4607. Oct. 17, 1904. Lat. 12° 00′ N., long. 91° 30′ W. Surface. 1 specimen.
Sta. 4611. Oct. 18, 1904. Lat. 10° 33′ N., long. 88° 30′ W. Surface. 10 specimens.
Sta. 4619. Oct. 20, 1904. Lat. 7° 15′ N., long. 82° 8′ W. Surface. 5 specimens.
Sta. 4640. Nov. 6, 1904. Lat. 0° 39.4′ S., long. 88° 11′ W. Surface. 1 specimen.
Sta. 4712. Dec. 31, 1904. Lat. 7° 5′ S., long. 93° 35.5′ W. Surface. 3 specimens.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. Surface. 2 specimens.
Sta. 4720. Jan. 14, 1905. Lat. 7° 13.3′ S., long. 102° 31.5′ W. Surface. 11 specimens.
Sta. 4723. Jan. 16, 1905. Lat. 10° 14.3′ S., long. 107° 45.5′ S. Surface. About 30 specimens.
Sta. 4725. Jan. 17, 1905. Lat. 11° 38.3′ S., long. 110° 5′ W. Surface. 8 specimens.
Sta. 4729. Jan. 19, 1905. Lat. 14° 15′ S., long. 115° 13′ W. Surface. 1 specimen.
Sta. 4733. Jan. 21, 1905. Lat. 16° 57.4′ S., long. 120° 48′ W. Surface. 1 specimen.

Besides this species was taken by the "Albatross" in 1899 at a single place:— Hyd. Sta. 3789. Sept. 9, 1899. Lat. 2° 38′ N., long. 137° 22′ W. Surface. 3 specimens. "Albatross."

Distribution.— This slender and small species, which has only been taken at the surface, is known from the Bay of Bengal (the author), is common in the Indian Archipelago ("Siboga"), and from here it is, according to the literature, distributed across the Pacific in its tropical area; Sars has mentioned it from the North Pacific. It has never been taken in the Atlantic.

12. **Siriella media** H. J. Hansen.

1910. *Siriella media* H. J. Hansen, Siboga-Exp., **37**, p. 38, pl. 4, figs. 3a–3k.

Butaritari, Gilbert Islands, Jan. 6, 1900. Lagoon. Surface. Light. 9 specimens (1 adult male, 8 immature specimens). "Albatross."

Remarks.— The presence of an adult male rendered it possible to determine the species. The strong setae of both rami of fourth pair of pleopods agree in every main point and even in most of minute particulars with my drawings (figs. 3e and 3f) in the paper quoted. The proximal joint of each exopod of the uropods with only 13 spines. The male is 9.5 mm. long.

Distribution.— *S. media* was hitherto known only from seven places in the Indian Archipelago ("Siboga").

13. **Siriella aequiremis** H. J. Hansen.

1910. *Siriella aequiremis* H. J. Hansen, Siboga-Exp., **37**, p. 40, pl. 3, figs. 4a–4c; pl. 4, figs. 1a–1l.

Sta. 4592. Oct. 13, 1904. Lat. 18° 20′ N., long. 103° 40′ W. Surface. 1 specimen.
Sta. 4619. Oct. 20, 1904. Lat. 7° 15′ N., long. 82° 8′ W. Surface. 7 specimens.
Hyd. Sta. 3789. Sept. 19, 1899. Lat. 2° 38′ N., long. 137° 22′ W. Surface. 1 adult female.

Remarks.— A couple of specimens are adult males, and the largest is 10.4 mm. The sexual setae on the endopod of fourth pleopods nearly as on fig. 1h in the "Siboga" paper, but the longest inner seta slightly overreaches the terminal, consequently intermediate between fig. 1h and fig. 1f.

Distribution.— *S. aequiremis* was established on specimens from the Indian Archipelago, where it was taken at ten places; furthermore it is known from the Arabian Sea, the Bay of Bengal, the Indian Ocean Lat at. 3° 9′ N., long. 84° 44′ E., and the China Sea (the author).

HEMISIRIELLA H. J. Hansen (1910).

14. **Hemisiriella abbreviata,** sp. nov.

Plate 2, figs. 2a–2c.

Butaritari, Gilbert Islands. Jan. 6, 1900. Lagoon. Surface. Light. 1 female with young. "Albatross."

Description.— Slender.— Carapace extremely short, leaving along the middle line nearly more than three segments uncovered; the frontal plate (fig. 2a) somewhat feebly produced, constituting a low triangle with the vertex acute. Eyes moderately large, very light brownish; the stalks somewhat broader than long and broader than the retina. The antennulae with the third peduncular joint distinctly less than twice as long as broad. The antennal squama short, about two and a half times as long as broad, with the terminal lobe beyond the base of the marginal tooth twice as broad as long.

Uropods (fig. 2b) with the endopod not overreaching the exopod, with five marginal spines occupying only about one fifth of the outer margin of the proximal joint of the exopod, and the distal joint somewhat less than twice as long as broad. Telson (figs. 2b and 2c) proportionately short, not reaching the articulation of the exopod, distinctly less than twice as long as broad, with two pairs of spines at the end of the broad proximal part, while its longer distal part is linguiform, with the proximal third of its lateral margins conspicuously concave and the end broadly rounded; the lateral margins of a little less than the distal half of the telson only with 4–5 spines irregular as to size and intervals, while the terminal margin has three extremely small spines in the interval between three pairs of long spines, the inner pair of which are slightly shorter than the most lateral pair, while the intermediate pair are considerably longer than the others; terminal feathered setae not observed.

Length of the single adult female 5.5 mm.

Remarks.— This species is allied to *H. pulchra* H. J. H., but is smaller with the eyes larger, the third joint of the antennular peduncle shorter in proportion to breadth, and the telson broader with a small number of lateral spines and three pairs of long terminal spines. Though the elongate endopod of the

first pair of legs is lost I refer this species to Hemisiriella, because the preserved second joint of these legs is thicker than that of second pair, because the carapace is extremely short, etc.

ANCHIALINA Norman (1906).

No specimen of this very characteristic genus was taken by Dr. Agassiz in 1904–1905, but three species were secured by the "Albatross" in 1900 at Butaritari, Gilbert Islands, and one of these species is new to science. The genus has been revised in my "Siboga" paper.

15. Anchialina typica (Kröyer).

1861. *Anchialus typicus* Kröyer, Nat. Tidsskr., 3 R., **1**, p. 53, tab. 2, fig. 7, a–l.
1910. *Anchialina typica* H. J. Hansen, Siboga-Exp., **37**, p. 52, pl. 7, figs. 2a–2k.

Butaritari, Gilbert Islands. Jan. 6, 1900. Lagoon. Surface. Light. 7 specimens. "Albatross."

Remarks.— The specimens are all adult males. They are somewhat small, measuring about 5.5 mm. in length, but they agree closely with smaller "Siboga" specimens in all particulars. The exopod of the third pair of pleopods has not four but only three long, slender processes, each with a terminal seta; these processes are found on the fifth, sixth, and seventh joint counted from the distal end, while in the "Siboga" specimen figured (fig. 2i) such processes are found on the fifth to the eighth joint; in small "Siboga" specimens such processes are wanting on the eighth joint or even on the seventh and the eighth joints, as already stated in my paper.

Distribution.— *A. typica* has a very wide distribution, and it may be sufficient to give an abstract of the statements in the "Siboga" paper. The species is known from tropical Atlantic (Kröyer), the West Indies, the Gulf of Siam, several places in the Indian Archipelago, and probably the Hawaiian Islands.

16. Anchialina grossa H. J. Hansen.

1910. *Anchialina grossa* H. J. Hansen, Siboga-Exp., **37**, p. 54, pl. 7, figs. 3a–3n; pl. 8, figs. 1a–1d.

Butaritari, Gilbert Islands. Jan. 6, 1900. Lagoon. Surface. Light. 1 specimen. "Albatross."

Remarks.— The specimen is an immature female. In the shape of the frontal plate with rostrum, the size of the eyes and the shape of the exopod of the uropods it agrees perfectly with females of *A. grossa* from the Indian Archipelago.

Distribution.— *A. grossa* was taken at several places in the Indian Archipelago, and besides it is known from the Gulf of Siam and the Bay of Bengal (the author).

17. **Anchialina obtusifrons,** sp. nov.

Plate 2, figs. 4a–4c.

Butaritari, Gilbert Islands. Jan. 6, 1900. Lagoon. Surface. Light. 2 adult males. "Albatross."

Description.— This species is in most particulars closely allied and similar to *A. grossa*. Frontal plate in the male (fig. 4a) less broad than in *A. grossa* and produced in a long rostrum reaching slightly beyond the eyes; this rostrum has the lateral margins a little concave, these being proximally somewhat converging forward and distally parallel, while the end of the rostrum looks nearly truncate, but its terminal, obtusely triangular portion is in reality bent downwards and backwards below the apparently terminal part. The eyes are brown and slightly larger than in *A. grossa*, broader than the end of the stalk which widens considerably from the base outwards.

Third joint of the antennular peduncle less thick and conspicuously longer than in *A. grossa*, being half as long again as broad. Antennal squama about as in *A. grossa*.

Gnathopods (fig. 4b) nearly as in *A. grossa;* second joint very large and much longer than broad; fifth joint strongly expanded, and from the inner side with a very large, lamellar, oblong-triangular, distally blunt process directed inwards and much forwards; sixth joint broad. First pair of thoracic legs as the following pair, with sixth joint divided into three subjoints.

Exopod of third male pleopods (fig. 4c) in the main as in *A. grossa*, with the distal joints much altered and furnished with several processes which constitute a most complex organ, though different in several minor particulars from that in *A. grossa*. The gigantic lamellar process (a.) on the posterior outer side is much narrowed somewhat before the end and its most distal part is also a little widened; the joint (b.) bearing the terminal processes is much longer than in *A. grossa*, with a terminal, lamellar expansion covering in front the insertion of these processes (c., d., and e.); finally, the inner process (e.) has more than its distal half very slender, the ramification of the median process (d.) is somewhat different from that in *A. grossa*, and the very long outer process (c.) has its secondary branch (c.[1]) adorned with a few low saw-like teeth.

Uropods with the endopod reaching about the end of the telson and somewhat longer than the exopod, which has the end broadly rounded, nearly truncate, and 15–17 spines along the outer margin.— Telson nearly as in *A. grossa*, but the proximal part of the terminal incision is narrower.

Length 7.5 mm.

Remarks.— As already stated, this species is on the whole allied and similar to *A. grossa*, but the male is easily distinguished by the quite different shape of the rostrum, by having the third antennular joint conspicuously longer in proportion to its breadth, and by the above-mentioned differences in the sexual organ terminating the exopod of third pair of pleopods.

GASTROSACCUS Norman (1869).

The "Albatross" secured several specimens in 1900, but none were found among the material of 1904–1905.

18. **Gastrosaccus pacificus,** sp. nov.

Plate 2, figs. 3a–3g.

Butaritari, Gilbert Islands. Jan. 6, 1900. Lagoon. Surface. Light. 8 specimens (3 (1 Type) adult males, 5 females with marsupium, 1 immature female). "Albatross."

Description.— Frontal plate, eyes, antennulae, and antennal squama (fig. 3a) nearly as in *G. indicus* H. J. H. (1910).— Male pleopods in the main as in *G. indicus*, but differing in some particulars. First pair (fig. 3b) with the endopod very slender, not one third as long as the exopod, which has the distal third divided into four joints. Second pair (fig. 3c) only a little more than half as long again as the first; the peduncle with second joint almost four times as long as broad; the endopod more than half as long as the exopod, with the distal major part of the proximal half considerably expanded on the outer side and the expansion distally terminating in a sharp, somewhat acute angle, while the distal part of the endopod is slender with a single articulation; the exopod is about as in *G. indicus*. Third pair (fig. 3d) with the endopod not distinguishable; the exopod is extremely elongate, but its distal portion is lost in all the specimens; the most proximal part of the exopod is strongly thickened, twice as long as broad and on the outer side distally produced into a rather short triangular process directed strongly outwards; somewhat beyond that thickened part three small spines are found. Fourth (fig. 3e) and fifth (fig. 3f) pairs nearly as in *G. indicus*; both rami unjointed, the exopod considerably more slender and on fourth pair slightly, on fifth pair considerably, longer than the endopod.

Uropods (fig. 3g) nearly as in *G. indicus*; the exopod with 11 or 12 marginal spines, most of them long, longer than in *G. indicus*. Telson nearly two and a half times as long as broad, with 10–12 spines along each margin, the terminal

spine included; the penultimate pair of spines considerably longer than the terminal pair, twice as long as the antepenultimate pair and nearly as long as the breadth of the telson at their insertion.

Length of both sexes 6.4 mm.

Remarks.— This species is a little smaller than *G. indicus*, but so closely allied that it might be considered a variety if it did not show the very marked difference in the third pair of male pleopods; the rather short, triangular process turning essentially outwards from the thick basal part twice as long as broad seems to be an excellent specific character, as this part differs very much in aspect from the corresponding portion in *G. indicus*, in which the thickened part is much shorter and the process much longer and directed much backwards or parallel with the exopod (Siboga-Exp., Pl. 8, figs. 2k and 2l); unfortunately the distal part of that exopod is wanting. The peduncles of the three anterior pairs of pleopods are more slender than in *G. indicus*.

All five adult females have a parasitic Isopod in the marsupium, probably a species of Prodajus, and allied to *P. ostendensis* Gilson which inhabits the marsupium of the European *Gastrosaccus spinifer* Goës.

EUCHAETOMERA G. O. Sars (1883).

To this genus Brutomysis Chun and Mastigophthalmus Illig ought to be referred. That Brutomysis must disappear is certain, as its single species, *B. vogtii* Chun, is without doubt a synonym to *E. typica* G. O. S. And Mastigophthalmus does not show any difference from Euchaetomera of real generic value, as the appendix at the eye-stalks is rather developed in *E. typica*, and the spinulation, length of flagella, etc., are only specific characters.

Three species, all captured in 1904–1905, are represented in the collection, and one among them is new.

19. **Euchaetomera typica** G. O. Sars.

Plate 2, figs. 5a–5c.

1883. *Euchaetomera typica* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 42.
1885. *Euchaetomera typica* G. O. Sars, Challenger Rept., **13**, p. 211, pl. 37, figs. 1–20.
1896. *Brutomysis Vogtii* Chun, Bibl. Zool., **7**, heft. 19, p. 179, taf. 15.
1906. *?Euchaetomera limbata* Illig, Zool. Anz., **30**, p. 203, fig. 10, A–D.

Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 2 specimens.

As the two specimens, a female with marsupium and an immature female (together with a third specimen from the Atlantic) differ considerably in a

number of features from the description and figures published by Sars, I asked my friend the excellent carcinologist Dr. W. T. Calman to examine the type preserved in the British Museum. I sent him tracings of my figures published in this paper of my specimen, together with a number of questions on particular features. Dr. Calman answered that the type "agrees better with your description and figures than with those of Sars in all the points you mention," and he added some notes and sketches which agree well with the features observed in my specimens. Therefore I will now give the following additions to the description of Sars.

The front margin of the carapace (fig. 5a) is furnished with spiniform processes or denticles, those on the most lateral fourth of each half of the margin are long and slender, and from here they decrease very much in size, being quite minute along a part of the margin towards the proportionately narrow and very short frontal plate which is produced into a rather slender and somewhat long, acute rostrum. The posterior margin of the carapace has a number of small or very small denticles, while the posterior margin of its lateral wings and the lateral margins are unarmed.

The eyes (fig. 5b) show peculiar features. The postero-lateral area of ocelli is, seen from above, a little more than half as long again as broad; there is no interval between the anterior and the postero-lateral area; the most posterior row of facets of the anterior area is of normal aspect, while each facet in the four following transverse rows of the anterior area is produced into a somewhat small, acute denticle; all other facets on the upper surface of the eye are simple, rounded. From the inner margin of the eye-stalks a little before the ocelli a very oblong, weak process or appendix projects forwards; in the adult female it is about as long as the part with spine-bearing ocelli on the opposite lateral margin.— The antennal squama (fig. 5c) is three times or a little more as long as broad, with the outer margin scarcely concave, the terminal lobe slightly broader than long and the outer distal process as long as, or a little shorter than, the terminal lobe and bent slightly outwards.— The thoracic legs (fig. 5d) on the outer side with a good number of moderately long setae; the distal half or one third of each of these setae is quite naked, while the remainder is very closely plumose; along the inner side of the legs the setae are less numerous, but several among them are very long, and all are naked or with extremely short hairs along the distal side.

First to third abdominal segment without denticles along the margins; fourth segment with very small denticles along the posterior and the lateral

margin, fifth and sixth segments with spiniform denticles along the same margins; most of these denticles are rather large though some small ones are interspersed.— The uropods (fig. 5e) have both rami much slenderer than shown in Sars's fig. 19 (which in this respect differs materially from his fig. 1).— Telson (fig. 5e) considerably broader than long, in the adult female with 6–7 spines along each lateral margin, while in the immature specimen only 4 and 6 spines were observed.

Length of the adult female 9 mm.

Remarks.— It will be seen that the additions and corrections to Sars's description and figures are rather numerous. I think that *Brutomysis vogtii* Chun, taken at Madeira, is the young male of the same species. The author states that the five anterior abdominal segments have a lateral armature, viz. 4 spiniform denticles at the postero-lateral angle of each segment, while the sixth segment has spines along the whole posterior margin. It is far from improbable that the lateral armature of the anterior abdominal segments is found only in the males, and if this supposition be correct, I think that the other differences between the specimens studied and Chun's description and figures are due to imperfections in the latter.— *E. limbata* Illig is possibly another species, because its squama, according to Illig's figure, has a shape somewhat different from that in *E. typica* and the carapace is, at least in the male, spiniferous around the whole margin.

Distribution.— Sars enumerated three localities in the Northern Pacific between Lat. 35° 22′ and 37° 52′ N., long. 169° 53′ E. and 160° 17′ W.; his specimens were from the surface of the sea. Ortmann recorded it from off Galera Point in the tropical East Pacific and from the Sargasso Sea and the Southern equatorial current in the Atlantic. Dr. J. Schmidt captured a single specimen West of Gibraltar at Lat. 36° 13′ N., long. 9° 44′ W.— Chun's *Brutomysis vogtii* was captured at Madeira, and Illig's *E. limbata* at two Stations in the Atlantic.

20. **Euchaetomera tenuis** G. O. Sars.

1883. *Euchaetomera tenuis* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 42.
1885. *Euchaetomera tenuis* G. O. Sars, Challenger Rept., **13**, p. 214, pl. 37, figs. 21–24.
1905. *Euchaetomera fowleri* Holt & Tattersall, Fisheries Ireland. Sci. Invest., 1902–3, (1905), p. 123 and 144; pl. 24, figs. 1–3.
1910. *Euchaetomera tenuis* H. J. Hansen, Siboga-Exp., **37**, p. 66, pl. 10, fig. 3a.

Sta. 4717. Jan. 13, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 1 immature female.
Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 1 adult female.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 1 male.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 1 adult female.

Remarks.— Illig states (Zool. Anz., **30**, 1906, p. 202) that the endopod of first pair of thoracic legs is wanting in *E. fowleri* and in his two new species of Euchaetomera, among which is the above-named *E. limbata*. As to *E. tenuis* Sars = *E. fowleri* Holt and Tatt. his statement is incorrect; the endopod is well developed both in the maxillipeds, the gnathopods, and in all six pairs of real legs; I am inclined to think that the same is the case in his two other species.

Distribution.— Sars's type was captured in the South Pacific off the coast of Chile. The "Siboga" secured it at two places in the Indian Archipelago. According to several authors (Ortmann, Tattersall, Holt and Tattersall, and myself) the species is widely distributed in the tropical and northern temperate Atlantic, in its eastern part going northwards to West of Ireland; and it has been taken in the Western Mediterranean also.

21. **Euchaetomera plebeja,** sp. nov.

Plate 3, figs. 1a–1b.

Sta. 4583. Oct. 11, 1904. Lat. 22° 45′ N., long. 110° 5′ W. 300 fms. to surface. 1 immature specimen.

Sta. 4676. Dec. 5, 1904. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 1 male, (Type), perhaps not quite adult.

Description.— Allied to *E. tenuis* G. O. S. and *E. oculata* H. J. H.— The frontal plate (fig. 1a) shaped as a low, broad triangle with the two sides a little concave and the vertex moderately broadly rounded.— The eyes about as thick as in *E. tenuis*, but the posterior area with acting facets is much larger, being longer than broad and the distance between the anterior and the posterior area at the outer margin distinctly less than half as long as the outer margin of the posterior area, while in *E. tenuis* that distance is about as long as the whole outer margin of the posterior area which is shorter than broad.— The antennal squama is five times as long as broad, with the outer margin almost or quite straight, no external tooth and the terminal lobe beyond the most proximal outer seta a little longer than broad.— The rami of the uropods (fig. 1b) broader in proportion to length than in *E. tenuis*.— Telson somewhat broader than long, otherwise as in *E. tenuis*.

Length of the male 5 mm., but the specimen is perhaps not quite full grown.

Remarks.— *E. plebeja* is instantly separated from *E. tenuis* by the much longer posterior dark area of the eyes and by the at least nearly straight outer margin of the antennal squama. *E. oculata* differs from *E. plebeja* by having a very conspicuous, somewhat narrow frontal plate, by considerably thicker eyes and by having the antennal squama only three and a half times as long as broad.

CRYPTOMYSIS, gen. nov.

Description (based on the female).— Body somewhat slender.— Carapace produced into a moderately large, triangular frontal plate (Plate 3, fig. 2a) and posteriorly not covering the entire cephalothorax.

Eyes very large, with short stalks. Antennal squama (fig. 2b) somewhat elongate, lanceolate, narrow, with a transverse suture and setose along both margins.— Labrum obtuse in front, without process.— Left mandible (figs. 2c–2e) has the incisive part well developed, a moderately strong, movable lobe, a couple of thick, digitate setae and the molar process somewhat long and thick; the palp is proportionately slender, its second joint (fig. 2e) somewhat curved, with its inner margin adorned with a row of regularly arranged, spiniform processes, each of which has a seta at the middle of its front margin; third joint of the palp rather short.— Maxillulae (fig. 2f) with the outer joint somewhat slender and a little angular at the middle of its exterior margin.— Maxillae (fig. 2g) somewhat elongate and narrow, with the exopod small and very narrow and the terminal joint not expanded distally and more than twice as long as broad.— Maxillipeds (fig. 2h) with first and second joints very long and moderately slender, first joint terminating in a free, minute lobe and second joint with a small lobe; third, fourth, and fifth joints each not longer than broad and without appreciable lobes; terminal joint small, triangular; claw well developed.

Gnathopods (fig. 2i) with second joint long and thick, without any real lobe; third and fourth joints somewhat small, transverse; fifth and sixth joints rather long, very slender and the fifth nearly naked; the claw somewhat long and strong.— The thoracic legs wanting excepting some exopods and a single endopod; the latter (fig. 2k) is slender, with fourth joint a little shorter than the fifth and a little longer than the sixth, which is divided by a transverse articulation near its end; only a few rather long setae on the endopod.

Uropods (fig. 2l) slender, with both rami setose along both margins as in the subfamily Mysinae; the otocyst well developed.— Telson (figs. 2l and 2m) quite aberrant; it is somewhat short, tapering considerably from the broad base to a little beyond the proximal two thirds of its length and then widening again, the terminal part being much broader than long, with the terminal margin nearly straight at the middle and broadly rounded at the sides; the whole margin of the terminal transverse part of the telson and the distal part of the lateral margins in front of that terminal part furnished with thick spines.

Remarks.— This new genus belongs to the subfamily Mysinae and is easily distinguished from all other genera by the shape of the telson. The male being unknown, I am unable to decide with any certainty whether the genus ought to be referred to the tribe Leptomysini or to the real Mysini. The shape of the antennal squama, of the maxillae and their palp, and the absence of lobes on the third and fourth joints of the maxillipeds seem to indicate relationship to the Leptomysini, while the shape of the telson resembles feebly that in *Anisomysis laticauda* H. J. H., which belongs to the tribe Mysini. The armature of the second joint of the mandibular palps bears a superficial similarity to the structure found in *Lycomysis spinicauda* H. J. H.

22. **Cryptomysis lamellicauda,** sp. nov.

Plate 3, figs. 2a–2m.

Fiji Islands. Off Vatu. Dec. 9, 1897. Plankton, 30 fms. 1 adult female. A. Agassiz.

Description.— Frontal plate (fig. 2a) about twice as broad as long, with the end very acute and distinctly acuminate.— Eyes very large, black.— Antennal squama (fig. 2b) between seven and eight times as long as broad, tapering from the middle, with the narrow end transverse and with the suture from the insertion of the penultimate lateral inner seta to the corresponding incision on the outer margin; the terminal joint not fully twice as long as broad.— Second joint of the mandibular palp (fig. 2e) with about thirteen teeth along the inner margin, those near the middle much longer than the most proximal or the most distal.

Sixth abdominal segment considerably longer than the fifth.— The rami of the uropods slender; the exopod almost seven times as long as broad, and considerably longer than the endopod.— Telson scarcely half as long as the endopod of the uropods, not fully half as long again as broad; the proximal part about as long as broad, with four somewhat strong spines towards the end of each margin; the distal portion a little more than half as broad again as long, with twenty spines, the lateral ones smaller and regularly tapering to the acute end, while the spines along the transverse and nearly straight posterior margin are longer, stronger, and taper only from beyond the middle to the acute end.

Length of the single specimen, a female with marsupium, 5.8 mm.

Remarks.— The specimen is dark coloured, but being far from well preserved and somewhat shrivelled in front it is not impossible that the dark colour may be due to the state of preservation.

DOXOMYSIS, gen. nov.

Description (based on a mutilated adult female).— Body moderately slender.— Carapace anteriorly produced into a rather short, triangular, frontal plate terminating in a rostrum, posteriorly not covering the entire cephalothorax.

Eyes large, with short stalks.— Antennal squama (Plate 3, fig. 3a) scarcely elongate, setose along both margins and with the end very obtuse.— Labrum obtuse in front, without process.— Left mandible (figs. 3b and 3c) with the incisive part, movable lobe, setae, and molar process well developed; the palp about as in the genera allied to Mysis.— The maxillae (fig. 3d) shaped nearly as in Michtheimysis Norm., with the terminal joint of the palp very large, much expanded and broader than long, but the exopod with only a few short setae. Maxillipeds (fig. 3e) with second joint long and terminating in a broad, well-developed, setose lobe; third and fourth joints very broad with broad, setose lobes; fifth and sixth joints broad; seventh joint triangular with its claw shaped as a thick seta.

(Gnathopods wanting).— The endopod of a single thoracic leg was preserved; it is very slender, its fifth joint somewhat longer than the fourth and a little shorter than the sixth; sixth joint divided into three subjoints by two transverse articulations, the first a little before, the second a little beyond the middle.

Uropods slender, both rami-shaped and setose as in the Mysini; the endopod below near the inner margin with a number of spiniform processes directed inwards and downwards.— Telson (figs. 3f and 3g) about half as long as the uropods, distally deeply cleft with minute spines along the margins of the triangular incision; the terminal lobes have the end broad and furnished with some spines.

Remarks.— The shape of the maxillipeds and of the terminal joint of the maxillae seems to prove that the genus belongs to the tribe Mysini, while the telson differs somewhat from that in genera hitherto known.

23. **Doxomysis pelagica,** sp. nov.

Plate 3, figs. 3a-3g.

Sta. 4640. Nov. 6, 1904. Lat. 0° 39.4′ S., long. 88° 11′ W. Surface. 1 mutilated adult female.

Description.— Frontal plate a little more than twice as broad as long, terminating in a slender rostrum unfortunately broken off at some distance from its origin.— Eyes large, but in very damaged condition.— Antennal squama

(fig. 3a) between five and six times as long as broad, with the outer margin a little concave and the inner convex, somewhat tapering from near the base to the broad, almost transverse end; the terminal joint somewhat longer than broad.

The abdominal segments furnished above and on the sides with a very large number of quite minute, mostly very slender denticles.— The exopod of the uropods nearly eleven times as long as broad.— Telson (figs. 3f and 3g) slightly more than half as long as the exopod of the uropods, almost twice as long as broad, with the outer margin somewhat concave; the terminal incision is deep, one third as deep as the length of the telson, oblong-triangular, somewhat rounded at the bottom and there with a couple of setae almost as long as the incision, while each of its lateral margins is furnished with 13–14 very small spines; slightly more than the distal half of each lateral margin of the telson is spiniferous, the proximal spines widely separated from each other, the more distal spines moderately close; the terminal lobes taper somewhat from the base of the incision to near the end, where they are feebly widened inwards; this end is broad and rounded, with four spines distinctly a little longer than the more distal lateral spines.

Remarks.— This species is easily distinguished by the shape and armature of the telson. The presence of a very large number of tiny denticles on the abdominal segments is interesting.

II. The Order **EUPHAUSIACEA.**

The collection contains representatives of eight genera. Only three genera hitherto known are wanting, viz. Meganyctiphanes Holt and Tatt., Thysanoëssa Kröyer (with Rhoda Sim or Boreophausia G. O. S.[1]), and Tessarabrachion H. J. H., but these are exclusively confined to the temperate and cold seas.

BENTHEUPHAUSIA G. O. Sars (1885).

Only a single species is known.

1. **Bentheuphausia amblyops** (G. O. Sars).

1883. *Thysanopoda* (?) *amblyops* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 23.
1885. *Bentheuphausia amblyops* G. O. Sars, Challenger Rept., **13**, p. 109, pl. 19; text-fig. 4.

[1] This topic has been dealt with in my paper on the genera and species of the order Euphausiacea (Bull. Mus. Océan. Monaco, no. 210, 1911).

Sta. 4676.	Dec. 5, 1904.	Lat. 14° 28.9′ S., long. 81° 24′ W.	300 fms. to surface.	1 specimen.
Sta. 4679.	Dec. 7, 1904.	Lat. 17° 26.4′ S., long. 86° 46.5′ W.	300 fms. to surface.	1 specimen.
Sta. 4681.	Dec. 8, 1904.	Lat. 18° 47.1′ S., long. 89° 26′ W.	300 fms. to surface.	2 specimens.
Sta. 4683.	Dec. 9, 1904.	Lat. 20° 2.4′ S., long. 91° 52.5′ W.	300 fms. to surface.	2 specimens.
Sta. 4707.	Dec. 29, 1904.	Lat. 12° 33.2′ S., long. 97° 42′ W.	300 fms. to surface.	1 specimen.
Sta. 4722.	Jan. 16, 1905.	Lat. 9° 31′ S., long. 106° 30.5′ W.	300 fms. to surface.	1 specimen.
Sta. 4740.	Feb. 11, 1905.	Lat. 9° 2.1′ S., long. 123° 20.1′ W.	300 fms. to surface.	3 specimens.

Distribution.— According to the literature this species is known from the Atlantic, where it extends northwards to Lat. 46° 15′ N. and southwards to a place off Tristan da Cunha; also from the Bay of Bengal, the Indian Archipelago, and South of Australia.

It is a true bathypelagic species and this explains perhaps that among the twelve specimens from seven Stations in the East Pacific only a single specimen (from Sta. 4707) seems to be really adult.

THYSANOPODA H. Milne Edwards (1830).

The material of this large and somewhat difficult genus is very rich, comprising nine species; a young specimen, which is very far from adult though not small, I have with some doubt referred to *T. cornuta* Illig, of which a much larger specimen is at hand. Only two valid species of this genus are not found in the collection, but both are known only from the North Atlantic.[1]

The maxillulae differ much from each other in various species, affording excellent specific characters, especially characters for quite small groups of species. In a couple of species the outer lamella from their first lobe, the "pseudexopod," is somewhat small, at most slightly overreaching the outer margin of third joint, while in most species the pseudexopod is of moderate size or very large, with its greater part reaching beyond the outer margin of third joint; furthermore the fourth joint, the palp, differs extremely as to length and breadth in various species. For these reasons I have given figures of the maxillulae of most species.— The maxillae of various species differ generally but little in shape, and therefore it has been deemed unnecessary to figure more than the maxilla of a single species.

Group a. *Carapace without any distinct cervical groove. Maxillulae with the pseudexopod from moderately large to very large, with at least almost their half situated beyond the outer margin of third joint, and with the palp at most moderately long and somewhat overreaching the third joint. Sixth abdominal segment longer than the fifth.*

[1] *Thysanopoda megalops* Illig as re-established by that author in July, 1911, on a specimen from the Indian Ocean is certainly a young and most probably the young of *T. egregia* H. J. H.

a. Carapace in the adults with a denticle on or near the lower margins near their posterior end.

2. **Thysanopoda tricuspidata** H. Milne Edwards.

Plate 4, fig. 2a.

1830. *Thysanopode tricuspide* H. Milne Edwards, Ann. Sc. Nat., **19**, p. 454, pl. 19.
1837. *Thysanopoda tricuspidata* H. Milne Edwards, Hist. Nat. Crust., **2**, p. 466, pl. 26, figs. 1–6.
1885. *Thysanopoda tricuspidata* G. O. Sars, Challenger Rept., **13**, p. 98, pl. 17, p. 165, pl. 31, figs. 1–22 (larval stages).
1910. *Thysanopoda tricuspidata* H. J. Hansen, Siboga-Exp., **37**, p. 82, pl. 12, figs. 3a–3b.

Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 1 specimen.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 2 specimens.
Sta. 4725. Jan. 17, 1905. Lat. 11° 38.3′ S., long. 110° 5′ W. Surface. 3 older larvae.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 6 specimens.
Sta. 4729. Jan. 19, 1905. Lat. 14° 15′ S., long. 115° 13′ W. Surface. 1 very young specimen.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 2 specimens.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 1 specimen.

To the description given by Sars and that in the "Siboga" Report some remarks on the maxillulae may be added for comparison with the same organs in the following forms. The lobe of first lobe, the proximal lobe (fig. 2a, l^1.) is somewhat broad, with the end nearly regularly rounded; the lobe from third joint (l^3.) is moderately broad, not widened towards the end, about as broad as the terminal part of the proximal lobe and considerably narrower than in the following species; the fourth joint (4.), the palp, is comparatively large, somewhat longer than the lobe of third joint, widening much from the base to beyond the middle, more than half as broad as long, with the end almost cut obliquely, setose both along the long and the little convex terminal margin, and on the outer margin. The pseudexopod (px) is only moderately large, not larger than the inner distal, transverse portion of the proximal lobe, very oblong, with about its half situated outside the outer margin of the third joint and covering only a very small part of the fourth joint.

Distribution.— According to the literature (Sars, Ortmann, Hansen) and to the material at hand this characteristic species is common in the tropical Atlantic, ranging northwards to the Sargasso Sea (Ortmann); it occurs also in the Indian Archipelago and adjacent areas, and it has been taken at various places in the tropical Pacific and even more to the southwards in that Ocean (Sars). The Copenhagen Museum possesses specimens from more than thirty localities, the majority from the Atlantic between Lat. 28° 12′ N. and 22° S., but eight among the Stations from the seas around Southeastern Asia, f. inst, Lat. 13° S., long. 103° 20′ E.; Lat. 16° 8′ S., long. 111° 50′ E.; Lat. 16° N.,

long. 115° 20′ E. Probably all the specimens in the Copenhagen Museum were taken at the surface of the sea during night.

3. **Thysanopoda cristata** G. O. Sars.

Plate 3, figs. 4a–4c; Plate 4, figs. 1a–1h.

1883. *Thysanopoda cristata* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 22.
1885. *Thysanopoda cristata*, G. O. Sars, Challenger Rept., **13,** p. 104, pl. 18, figs. 15–20.
1893. *Thysanopoda biproducta* Ortmann, Ergebn. der Plankton-Exped., **2,** G. b. p. 8, taf. I, fig. 1.

Sta. 4699. Dec. 25, 1904. Lat. 21° 39.5′ S., long. 104° 29.8′ W. 300 fms. to surface. 1 young specimen.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 1 adult male.
Sta. 4736. Jan. 23, 1905. Lat. 19° 0.4′ S., long. 125° 5.4′ W. 300 fms. to surface. 1 immature specimen.

Description.— The frontal plate (Plate 3, fig. 4b) long, only a little broader than long with the lateral margins considerably concave, strongly tapering forwards and narrow in front, where it terminates in a moderately short, slender rostrum which at its base is distinctly narrower than the end of the plate; in the adult specimen (and in Sars's type) the rostrum seems to be articulated to the end of the plate, but whether this is the normal state or is due to injury I cannot decide. In the two much smaller specimens the rostrum is broader at the base and not well-marked off. At the anterior end of the frontal plate a very conspicuous, somewhat high, sharp dorsal keel is suddenly raised (Plate 3, figs. 4a and 4c), the front end of which is even emarginate and terminates above in a point; the keel goes backwards to near the middle of the carapace, and about at the middle of its length, where the dorsal organ is found, it is rather suddenly somewhat higher, while it is rounded downwards towards its posterior end; in the smallest specimen the keel has no angle or incision at its front end, and its anterior half decreases in height towards the rostrum where it disappears. The carapace has no cervical suture, but two oblique, moderately short impressions on each side at a distance from the front lateral margin of about one third of the length of the carapace; the upper of these impressions is nearly horizontal, the lower very oblique and below limited by a low narrow ridge. The lateral part of the front margin of the carapace below the eye is produced in a triangular, acute, somewhat small plate; at a considerable distance from the lower margin a deep furrow is seen, beginning above the insertion of the maxilla and reaching to near the hind margin of the carapace, where it bends upwards and terminates at the middle of the side. A small tooth (omitted in fig. 4a by the engraver) is found above the lateral margin — in the small specimen on the margin — of the carapace somewhat before its posterior end; the tooth is acute, directed outwards, forwards, and downwards.

The eyes are of moderate size, with the eye-stalks short.— The antennular peduncles are somewhat short and in adults very thick (Plate 4, figs. 1a and 1b); in a little more than half-grown specimen much more slender (fig. 1c). Seen from the side (fig. 1a) the distal upper part of the first joint is raised as a high and thick, vaulted, setose roof above the insertion of the second joint; seen from above (fig. 1b) the same distal part is produced forwards as a short triangle with the inner angle acute, but without any process or armature; on the outer margin of the joint a somewhat small, oblong process is seen. The second joint in the adult has, seen from the side (fig. 1a), its distal half considerably vaulted above; seen from above (fig. 1b) its breadth is as long as its inner margin, while distally and a little nearer the outer than the inner margin it is produced forwards in a triangular, acute lobe considerably broader than long and with its end pointing outwards and especially forwards. Third joint in the adult with the distal part of the upper margin considerably arched, rounded, but the dorsal crest is not well defined. In considerably smaller specimens the vaulting of the distal parts of the joints is much less developed (fig. 1c).— The antennal squama reaches the middle of third antennular joint and has a distinct triangular tooth at the outer distal angle; the spiniform process from the outer end of the peduncle is scarcely one fourth as long as the squama.

The maxillulae (Plate 4, fig. 1d) are in the main intermediate between those in *T. tricuspidata* and in the following forms. The proximal lobe is considerably smaller than in *T. tricuspidata* and somewhat angular at the inner distal end; the distal lobe is much broader than the proximal, a little widened towards the terminal margin which is slightly convex; the palp is somewhat longer than the distal lobe, narrow, between three and four times as long as broad and tapering beyond the middle. The pseudexopod is a little broader and distinctly longer than in *T. tricuspidata*, but not reaching much beyond the proximal angle of the insertion of the palp.

The lateral plates of the five anterior abdominal segments are broad and deep; those of second to fourth segments with the lower margin a little irregularly emarginate; fourth and fifth segments each with a dorsal spiniform denticle; sixth segment uncommonly short and deep. The inner ramus of the uropods conspicuously shorter than the outer which reaches a little beyond the tip of the telson.— Telson has in Sars's type seven pairs of dorsal spines (it is mutilated in my adult specimen).

The copulatory organs (Plate 4, figs. 1e–1h) show some peculiarities. The spine-shaped process (p^1.) is moderately curved. The terminal process (p^2.)

is medium sized, seen from behind (fig. 1f) considerably curved at the middle, with the convex margin outwards and with the end compressed; seen from the inner side (fig. 1g) the proximal half is besides a little curved, while a somewhat short terminal part of the distal half is a little widened, very oblong, subacute and bent to the left. The proximal process (p^3.) overreaches considerably the terminal; it is proportionately not thick at the base and tapers gradually towards the other obtuse end; its distal third is very slender; it is curved somewhat inwards at the end of its proximal fourth, while its distal half constitutes a portion of a circle with the convex margin inwards. The median lobe (lm.) is long and about its distal fourth is nearly lamellar; this lobe is produced distally with the tip rounded, and the lamellar part is bent inwards, covering, seen from behind, the distal part of the lateral process. This process (p^4.) is very long, a little curved to the beginning of its terminal fifth, which is much curved inwards and especially forwards and in reality considerably longer than seen on the figures (figs. 1e and 1h) as these do not exhibit the process from the inner side. The additional process (fig. 1h, which shows both the lateral and the additional process seen from in front) is situated at the base of the lamellar part mentioned; it is short, somewhat oblong, very thick to near the end which is acuminate, acute, and somewhat curved. The auxiliary lobe (lu.) is somewhat short. The setiferous lobe (ls.) is nearly lanceolate with the end rounded and with setae along both margins to their base.

Length of the adult male 38 mm., of the two other specimens respectively 23 mm. and 18 mm. Sars's type measures 48 mm. in length.

Remarks.— In 1907 I compared the largest specimen in the Agassiz collection directly with Sars's type in the British Museum and found that they agree perfectly with each other. Consequently Sars's figs. 15–16 are inaccurate in various particulars of the carapace and the antennular peduncles. Sars figured the rostrum bent downwards, but this is quite accidental, as the rostrum is articulated to the frontal plate or broken at the base (see above). Furthermore his fig. 15 exhibits a cervical groove and other furrows on the anterior half of the carapace, but they do not exist, while he did not draw the two short lateral impressions really existing and shown in my figures. He figured the dorsal keel a little higher than in his specimen, and he overlooked the denticle above the lateral margin somewhat from its posterior end. The antennular peduncles are not well drawn in his figures. Finally, his statement on the length of his specimen (he states it to be 55 mm.) indicates that he here, and probably elsewhere in his work, measured the animal from the end of the

antennal squama instead of from the tip of the rostrum.— Ortmann's description is incomplete and his figure not very good, but I have no doubt that he examined a young specimen of this species.

It may be added that the postero-lateral denticle on the carapace changes its place. In the smallest specimen it protrudes from the lateral margin itself, in the somewhat larger specimen a little above that margin, and in the adult male still a little higher, but yet slightly nearer to the lower margin than to the longitudinal furrow.

Distribution. This species has a very extensive distribution but seems to be rare, only two specimens being mentioned in the literature. The type of Sars was taken at Lat. 5° 47′ N., long. 124° 1′ E., South of Mindanao, Philippine Islands; Ortmann's specimen was captured in the Sargasso Sea, North Atlantic. For various reasons I think that adult specimens generally live in very considerable depths.

4. **Thysanopoda monacantha** Ortmann.

Plate 4, figs. 3a–3c.

1893. *Thysanopoda monocantha* Ortmann, Ergebn. du Plankton-Exped., **2,** G. b. p. 9, taf. 1, fig. 2.
1894. *Thysanopoda agassizii* Ortmann, Bull. Mus. Comp. Zoöl., **25,** p. 99, plate, figs. 1–2.
1905. *Thysanopoda lateralis* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 30, p. 18.
1908. *Thysanopoda ctenophora* Illig, Zool. Anz., **23,** p. 112.
1910. *Thysanopoda agassizii* H. J. Hansen, Siboga-Exp., **37,** p. 87, pl. 13, figs. 3a–3g.

Sta. 4634. Nov. 4, 1904. Lat. 4° 35.4′ N., long. 83° 32.3′ W. 300 fms. to surface. 1 very young specimen.
Sta. 4663. Nov. 16, 1904. Lat. 11° 20.3′ S., long. 88° 55.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 18 specimens.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 17 specimens.
Sta. 4683. Dec. 9, 1904. Lat. 20° 2.4′ S., long. 91° 52.5′ W. 300 fms. to surface. 8 specimens.
Sta. 4685. Dec. 10, 1904. Lat. 21° 36.2′ S., long. 94° 56′ W. 300 fms. to surface. 1 specimen.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 1 specimen.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 16 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 33.2′ S., long. 97° 42′ W. 300 fms. to surface. 1 specimen.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms to surface. 13 specimens.
Sta. 4711. Dec. 31, 1904. Lat. 7° 47.5′ S., long. 94° 5.5′ W. 300 fms. to surface. 2 specimens.
Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 3 specimens.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 2 specimens.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 7 specimens. (1 very small).
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 1 small specimen.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 3 specimens, very small.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 1 specimen.

Remarks.— Both subadult specimens, very young specimens, and older larvae have been described and figured in the "Siboga" paper quoted. Here a few remarks are sufficient.

The maxillulae (fig. 3a) are still more developed in the directions already indicated in *T. cristata*. The proximal lobe (l^1.) is a little larger than in that species; the distal lobe (l^3.) expands considerably in breadth from the insertion of the palp to the very broad end, the margin of which is feebly convex with the angles rounded, and the lobe is more than half as broad again as the proximal and considerably broader than long, the length measured to the distal part of the insertion of the palp. The palp (4.) is rather short, not reaching the end of the distal lobe, slender and tapering to the transversely cut end. The pseudexopod (px.) is extremely large, twice as long as broad and reaches even a little beyond the end of the distal lobe.

Ortmann has seen a specimen 32 mm. long. The largest specimen in the Agassiz collection is a female measuring 27 mm., but among the males, measuring about 22–24 mm., not a single specimen seems to be adult, as may be judged from the stage of development of the lobes and especially of the processes of the copulatory organs. Fig. 3b and fig. 3c exhibit the two lobes of two males; the spine-shaped process is, as usual in immature specimens, well developed, but the terminal and the lateral processes are simple and slender conical, and the proximal process is nearly similar, yet a little or somewhat curved at the middle. The additional process on fig. 3b is also slender conical, while fig. 3c exhibits a most interesting feature, viz. three additional processes (p^5.) of the same undeveloped character. I suppose that the existence of three additional processes is a casual anomaly, but the question ought to be studied by a future investigator who has a number of adult males at his disposal.

Distribution.— This species was established on a specimen taken in the Guinea current in the tropical Atlantic; the Monaco specimen described as *T. lateralis* is from Lat. 27° 43′ N., long. 18° 28′ W.; *T. ctenophora* Illig from the Gulf of Guinea. *T. agassizii* Ortm. which, according to my opinion, cannot be separated from *T. monacantha*, was described from specimens taken in the Gulf of Panama and between the Galapagos and Acapulco; a specimen was captured in the waters of the Hawaiian Islands (Ortmann) and several specimens were secured by the "Siboga" in the Indian Archipelago. In the area explored in 1904–1905 the species was not taken in the two most southern districts or in a broad belt along the coast of South America. I suppose that adult specimens live in considerable depths, at least generally in more than 300 fms. from the surface.

5. **Thysanopoda aequalis** H. J. Hansen.

Plate 4, fig. 4a.

1905. *Thysanopoda aequalis* H. J. Hansen, Bull. Mus. Océan Mon., no. 42, p. 19.
1910. *Thysanopoda aequalis* H. J. Hansen, Siboga-Exp., **37**, p. 84, pl. 12, figs. 4a–4c; pl. 13, fig. 1a.

Sta. 4681.	Dec. 8, 1904.	Lat. 18° 47.1′ S., long. 89° 26′ W.	300 fms. to surface. 1 specimen.
Sta. 4683.	Dec. 9, 1904.	Lat. 20° 2.4′ S., long. 91° 52.5′ W.	300 fms. to surface. 9 specimens.
Sta. 4685.	Dec. 10, 1904.	Lat. 21° 36.2′ S., long. 94° 56′ W.	300 fms. to surface. 3 specimens.
Sta. 4687.	Dec. 11, 1904.	Lat. 22° 49.5′ S., long. 97° 30.6′ W.	300 fms. to surface. 8 specimens. 2125 fms. to surface. 5 specimens.
Sta. 4689.	Dec. 12, 1904.	Lat. 24° 5′ S., long. 100° 20′ W.	300 fms. to surface. 1 specimen.
Sta. 4691.	Dec. 13, 1904.	Lat. 25° 27.3′ S., long. 103° 29.3′ W.	300 fms. to surface. 9 specimens.
Sta. 4695.	Dec. 23, 1904.	Lat. 25° 22.4′ S., long. 107° 45′ W.	300 fms. to surface. 1 specimen.
Sta. 4701.	Dec. 26, 1904.	Lat. 19° 11.5′ S., long. 102° 24′ W.	300 fms. to surface. 10 specimens.
Sta. 4703.	Dec. 27, 1904.	Lat. 17° 18.6′ S., long. 100° 52.3′ W.	300 fms. to surface. 3 specimens.
Sta. 4705.	Dec. 28, 1904.	Lat. 15° 5.3′ S., long. 99° 19′ W.	300 fms. to surface. 20 specimens.
Sta. 4722.	Jan. 16, 1905.	Lat. 9° 31′ S., long. 106° 30.5′ W.	300 fms. to surface. 2 specimens.
Sta. 4724.	Jan. 17, 1905.	Lat. 11° 13.4′ S., long. 109° 39′ W.	300 fms. to surface. 4 specimens.
Sta. 4728.	Jan. 19, 1905.	Lat. 13° 47.5′ S., long. 114° 21.6′ W.	300 fms. to surface. 4 specimens.
Sta. 4730.	Jan. 20, 1905.	Lat. 15° 7′ S., long. 117° 1.2′ W.	300 fms. to surface. 11 specimens.
Sta. 4732.	Jan. 21, 1905.	Lat. 16° 32.5′ S., long. 119° 59′ W.	300 fms. to surface. 10 specimens.
Sta. 4740.	Feb. 11, 1905.	Lat. 9° 2.1′ S., long. 123° 20.1′ W.	300 fms. to surface. 1 specimen.

Remarks.— To my earlier descriptions of this characteristic species some notes on the maxillulae (fig. 4a) may be added. They differ in some features from those in *T. monacantha*. The proximal lobe is medium sized, with the terminal, somewhat convex margin rather oblique; the distal lobe expands somewhat towards the feebly convex terminal margin, is somewhat broader than long and more than half as broad again as the proximal; the palp is very oblong-oval with the end very obtuse, besides nearly two and a half times as long as broad and reaches the end of the distal lobe. The pseudexopod is large, yet a good deal smaller than in *T. monacantha*, twice as long as broad and reaches considerably beyond the insertion of the palp.

Length of one of the largest specimens, an adult male, 17.5 mm.

Young Specimens.— Specimens measuring 6.5–8 mm. differ in two important particulars from subadults and adults. The frontal plate is proportionately larger, flatter, and the rostrum is a minute, quite horizontal denticle. The eyes are much higher than broad, with the upper half yellowish or light brownish and marked off from the distinctly or much darker lower half. The lobe from the first antennular joint has not acquired its full size, but its shape shows that the specimens belong to this species.— Specimens measuring about 10 mm. are intermediate between the adults and the young as to the organs mentioned.

Distribution.— The species is common in the eastern part of the Atlantic from Lat. 36° 17′ N. to Lat. 28° N. (Monaco collection), and it has been taken in the Mediterranean (Tattersall). The Copenhagen Museum possesses speci-

mens from four localities in the Eastern Atlantic between Lat. 28° N. and Lat. 23° N., besides from the Central Atlantic at Lat. 5°–7° 15′ N., long. 30° W., from Southern Atlantic at Lat. 30½° S., long. 22½° W., finally from five Stations in an area across the more southeastern part of the Indian Ocean, viz. between Lat. 22½° S. and 27½° S., long. 80° E. and 103° E. From the Hawaiian waters (the label has Sta. 3808. From between Erben Bank to Kaiwi Channel) I have seen nine specimens belonging to this species but referred by Ortmann (1905) to *T. obtusifrons* G. O. S. In the area explored in 1904–1905 this species is confined to the southern part, not going North of Lat. 9½° S.— The specimens in the Copenhagen Museum have certainly all been taken at the surface during night.

6. **Thysanopoda obtusifrons** G. O. Sars.

Plate 4, figs. 5a–5f.

1883. *Thysanopoda obtusifrons* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 21.
1885. *Thysanopoda obtusifrons* G. O. Sars, Challenger Rept., **13,** p. 102, pl. 12, figs. 1–14.
1905. *Thysanopoda vulgaris* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 30, p. 15.
1905. *Thysanopoda vulgaris* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 20.
1910. *Thysanopoda obtusifrons* H. J. Hansen, Siboga-Exp., **37,** p. 81.

Sta. 4683. Dec. 9, 1904. Lat. 20° 2.4′ S., long. 91° 52.5′ W. 300 fms. to surface. 7 specimens.
Sta. 4685. Dec. 10, 1904. Lat. 21° 36.2′ S., long. 94° 56′ W. 300 fms. to surface. 11 specimens.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. { 300 fms. to surface. 6 specimens. / 2125 fms. to surface. 3 specimens.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 2 specimens.
Sta. 4691. Dec. 13, 1904. Lat. 25° 27.3′ S., long. 103° 29.3′ W. 300 fms. to surface. 4 specimens.
Sta. 4695. Dec. 23, 1904. Lat. 25° 22.4′ S., long. 107° 45′ W. 300 fms. to surface. 2 specimens.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 2 specimens.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 2 specimens.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20′ W. 300 fms. to surface. 1 specimen.

Description.— The frontal plate (figs. 5a–5b) is considerably produced, about twice as broad as long, broadly obtuse, with the front margin rounded or a little angular at the middle and somewhat shorter than one of its oblique lateral margins; on its end is seen the rostrum transformed as a small, vertical, conical tooth or at least a vestige of such a tooth; the plate is thick, longitudinally concave at the middle, so that a pair of submedian obtuse keels, united in front at the rostrum mentioned, is formed, and a little behind the rostrum begins a rather low median keel which is highest considerably behind the end of the submedian keels and occupies about two fifths of the length of the carapace. The carapace has a minute, but distinct, denticle on the outer side of the lateral margin somewhat before its posterior end, while the produced part of the anterior margin above the antennae is only a minute tooth; a furrow runs close to the lateral margin along its entire length and bends upwards along a portion of the posterior margin, but the carapace has no other grooves.

The eyes are somewhat small, dark brownish or nearly black.— The antennulae have the first joint of the peduncle short and very broad, with a moderately short, spiniform process from the distal outer angle; above the joint is distally strongly raised as an obliquely transverse, vaulted part, from which a subquadrangular lobe projects forwards, closely covering not quite the inner half of the proximal part of second joint; this lobe is moderately thick, with the outer margin nearly straight or a little convex, the distal margin not longer than the base and the outer distal angle either simple or produced in a small tooth; the upper surface of the lobe is set with somewhat short, stiff setae. The second antennular joint is produced anteriorly above into a kind of short, broad, distally rounded lobe, the front margin of which begins at a point somewhat removed from the outer angle of the joint and goes inwards and considerably forwards to the inner margin of third joint. Third joint with the dorsal keel well defined, but low.— The antennal squama reaches at least to the distal end of second antennular joint; it is broad, with the end nearly truncate and without any outer distal tooth. The spiniform process from the peduncle about one third as long as the squama (fig. 5b).— The maxillulae (fig. 5c) essentially as in *T. aequalis*, but the proximal lobe has the end nearly obliquely cut off, the distal lobe is considerable widened towards the end and much broader than long; the palp is slender, about four times as long as broad, reaching the end of the distal lobe; the pseudexopod is extremely large, twice as long as broad and reaches about the end of the palp.

The abdominal segments are without any dorsal denticle; the side-plates of second to fourth segment with the lower margin a little emarginate. The preanal spine middle sized, simple, curved, and acute.— The uropods about as long as the telson, with the endopod a little shorter than the exopod.— The telson with six or seven pairs of dorsal saw-teeth.

The copulatory organs (figs. 5d–5f) show several distinguishing features. The spine-shaped process (p^1.) is well developed, placed at the inner margin of the inner lobe not far from its end. The terminal process (p^2.) of moderate length and thickness, slightly curved, seen from behind (fig. 5d) with the distal third tapering to the obtuse end; seen from the inner side (fig. 5e) the distal part is compressed with the outer margin somewhat serrate, the other margin somewhat convex. The proximal process (p^3.) with the basal portion very thick and directed much outwards; then it bends abruptly forwards and at the bend a kind of heel-shaped process is directed outwards; the major distal part is, seen from behind (fig. 5d), feebly curved, seen from the inner side (figs. 5e and 5f) considerably curved beyond the middle and somewhat expanded but tapering

again to the end, which is truncate and at the posterior margin produced into a tooth. The median lobe has the basal part somewhat broad, and the lateral process (p^4.) is inserted a little before its middle; this process has the basal part thickened and the distal fourth bent inwards and forwards; the additional process (p^5.) is long, only a little shorter than the lateral, moderately robust, somewhat curved and overreaching the lobe; the distal part of this lobe is an oblong and obliquely triangular lamella which, seen from behind, is bent inwards, covering the proximal half of the additional process. The auxiliary lobe is rather long and thick. The setiferous lobe is moderately broad, with setae along the major part of both margins, there being a naked interval on the subdistal part of the outer margin.

Length of the largest specimens of both sexes 20 mm.

Young Specimens.— In specimens measuring only 8–10.5 mm. the rostrum is a horizontal denticle and the eyes are oblong, yellowish brown, but at least generally without any difference in colour between their upper and lower half; the shape of the small lobe from the first antennular joint shows that such specimens belong to this and not to the preceding species.

Remarks.— This species is closely allied to *T. aequalis* H. J. H., but the lobe from first joint of the antennular peduncle is quite different in the two species, and the male copulatory organs are sharply distinguished especially by the feature that the spine-shaped process is well developed in *T. obtusifrons* and wanting in *T. aequalis*.

Errors and deficiencies in Sars's figures have been pointed out in the "Siboga" Report; besides Sars states that the lateral margins of the carapace have no denticle, but a minute denticle is always present.

Distribution.— Sars's type was captured in the South Pacific at Lat. 32° 36′ S., long. 137° 43′ W., but the specimens from the Hawaiian Islands mentioned by Ortmann (1905) belong to *T. aequalis*. A good many specimens were captured by the Prince of Monaco in the Eastern Atlantic between Lat. 36° 46′ N. and lat. 27° 43′ N. The Copenhagen Museum possesses a specimen from Lat. 27° 30′ S., long. 98°–99° 10′ E.

The distribution in the area explored in 1904–1905 is nearly the same as that of *T. aequalis*, but less common. Curiously enough, it has not been taken by the "Siboga" and is not found among the rather rich Copenhagen material from the Chinese and Japanese seas.

β. Carapace in the adults without denticles on the lateral margins near their posterior end.

7. **Thysanopoda pectinata** Ortmann.

Plate 5, figs. 1a–1m.

1893. *Thysanopoda pectinata* Ortmann, Ergebn. der Plankton-Exped., **2**, G., b., p. 10, taf. 1, fig. 4.
1905. *Thysanopoda pectinata* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 25.
1909. *Parathysanopoda foliifera* Illig, Zool. Anz., **35**, p. 225 (young).

Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 1 specimen.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 2 specimens.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 2 specimens.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 14 specimens.
Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 5 specimens (1 among them very young).
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 50′ W. 300 fms. to surface. 7 specimens.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 1 specimen, young.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 1 specimen.

Description.— The frontal plate is produced, in the Pacific specimens frequently nearly triangular, with the lateral margins feebly convex towards the acute end (fig. 1a), but sometimes the margins are distally more convex and the end broadly rounded, a little angular at the middle (fig. 1c); in specimens from the North Atlantic the anterior part of the frontal plate is much broader with a somewhat long and feebly curved transverse margin in front; on the end or slightly behind the end of the frontal plate a minute vertical tooth — the remainder of the rostrum in the young — is seen; the plate is very thick and longitudinally concave at the middle so that a pair of submedian keels are formed uniting at the tooth mentioned, and a little or somewhat behind the tooth begins in the bottom of the median excavation the median keel, which is rounded, rather low, increases in height at the dorsal organ and disappears somewhat before the place where the non-existent cervical groove is to be looked for; the lateral edges of the frontal plate are bent a little upwards, so that the surface becomes a little excavated along each margin. The carapace has a longitudinal furrow close at the lateral margin almost from its anterior end, and posteriorly this furrow is curved upwards along the lower half of the posterior margin; the surface of the carapace without any other groove or impression; the produced part of the anterior margin above the antennae is a small, short, acute triangle.

The eyes are somewhat small, black.— The antennulae (figs. 1a–1b) are very characteristic. The basal joint is somewhat short and very broad, with a moderately short, spiniform process at the distal outer angle; the joint is distally strongly raised as an obliquely transverse, vaulted part with a number

of strong, partly long setae, and from that part a quite peculiar lobe projects forwards, closely covering the major part of the proximal half of the second joint; the lobe is at its origin about half as broad as the base of second joint, but it is rapidly strongly expanded outwards, thus furnished with a kind of triangular lateral wing projecting outwards and somewhat downwards above the upper lateral surface of second joint; the anterior margin of the lobe, the wing included, is straight or a little concave, nearly transverse and produced in a row of 8 to 13 thin, spiniform processes which increase in length from the inner to the outer, the inner being short and directed forwards, the outer rather long and directed outwards to a great degree. The second joint is above and inwards produced in a lobe which, seen from above, covers closely the proximal third or rather two fifths of the inner half of the upper surface and the inner margin itself of third joint; seen from above the outer angle of this lobe is convex, subangular, or rounded, while the front margin of the second joint is somewhat hollowed outside the base of the lobe. The third joint with the dorsal keel well defined, scarcely half as long as the joint and rather low.— The antennal squama reaches the middle of third antennular joint, it is broad, distally subtruncate with the outer corner subrectangular and without denticle; the spiniform outer process from the subbasal joint is conspicuously or even considerably shorter than the breadth of the squama.— The maxillulae (fig. 1d) are quite peculiar; the proximal lobe has the end nearly regularly rounded; the distal lobe is extremely broad, distally strongly expanded, broader than long and twice as broad as the proximal lobe; the palp (4.) is very small, ovate, not one third as long as the distal lobe, completely covered by the pseudexopod, which is very large, twice as long as broad.

The abdominal segments are without any trace of dorsal denticles. The lateral plates of second to fourth segments with the lower margin a little emarginate. The preanal spine well developed, simple in the male, more rarely simple, but generally bifid in the female.— The uropods with the endopod slightly or somewhat longer than the telson and somewhat shorter than the exopod.— The telson with two pairs of dorsal denticles and no serration; the subterminal spines extremely long.

The copulatory organs (figs. 1e–1i) afford excellent characters. The spine-shaped process (p^1.) is rather long, thin, bent strongly inwards near the end of its first third and with the distal part somewhat curved. The terminal process (p^2.) with its proximal third thick and subcylindrical; then it is curved slightly inwards and gradually widened and flattened to the end, which is conspicu-

ously broader or even nearly twice as broad as the basal part and very broadly rounded with the terminal margin somewhat or feebly convex; besides the process is a little excavated on the anterior surface along the terminal margin, which consequently is a little raised (fig. 1f). The proximal process (p^3.) far from reaching the end of the terminal; the basal part is thick, and then the process is abruptly bent considerably inwards and its terminal third curved again in the opposite direction; at the proximal bend a short or rather long "heel" projects on the outer side; the distal third is somewhat compressed with a couple of irregular teeth on the very oblique terminal margin (fig. 1g, which shows the distal part seen from the outer side). The median lobe with the proximal half broad; the lateral process (p^4.), which is inserted at the middle of the inner margin of the lobe, is rather long, moderately slender, with the most distal part bent strongly inwards and forwards. The additional process (p^5. and fig. 1h) is a strong hook, the major, proximal part being oblong, a little curved and strongly vaulted on one side, and the distal part is somewhat slender, acute, and curved strongly outwards; when the organ is seen from behind (fig. 1e) the major part of the process is covered by the distal part of the lobe, the end of which is broadly rounded. A little beyond the insertion of the lateral process a secondary additional process (p^6.) is observed on the posterior surface of the lobe; this process is quite small and shaped as a straight needle. The auxiliary lobe of moderate size. The setiferous lobe is moderately broad, with setae along nearly the whole inner margin, the oblique distal end and the proximal half of the outer margin, while most of the distal part of this margin is naked.

Length of the largest female from the Pacific 29 mm., of adult males 24–29.5 mm. Specimens from the Atlantic are much larger; the Monaco collection contains a female 40.5 mm. long and a male 40 mm. long, while Ortmann stated that his single specimen measured 44 mm. in length.

Very young Specimens.— Figs. 1k–1m show parts of a young specimen measuring 11 mm. in length. The frontal plate is long, much longer than in the adult, somewhat shorter than broad, with the distal third of the lateral margins somewhat convex, and terminating in a small, nearly spiniform, horizontal rostrum; the upper side of the plate longitudinally concave, without submedian keels, and the median keel begins somewhat behind the frontal end, increasing conspicuously and regularly in height to the dorsal organ. The carapace has a very distinct tooth on the lateral margins a little from their posterior end. The eyes differ much from those in the adults; seen from above (fig. 1k) the stalk is much thickened; seen from the side (fig. 1l) the eye is much higher

than broad and distinctly divided by a constriction into an upper somewhat small and a lower, conspicuously broader and much higher area; the colour is dark brown. The antennulae have the process from the outer distal angle of first joint proportionately longer than in the adults; the lobe from the same joint is only a little expanded towards the end, with about six terminal teeth which are shorter than in the adults; the lobe from second joint is also shorter than in the adults.— Two such specimens are at hand.

Remarks.— This species is easily distinguished from all other forms of the genus by the terminal row of spiniform teeth on the lobe from first antennular joint.

During a long time I considered the specimens from the Pacific as belonging to a separate and new species, because the shape of their frontal plate differs materially from that of my single female specimen of *T. pectinata* from the Atlantic, and this specimen and that recorded by Ortmann are much larger than any specimen in the rich Agassiz material. But in the winter 1910–1911 I obtained from Monaco several recently captured specimens of *T. pectinata*, among them two adult males; the examination of the copulatory organs of these specimens did not reveal any difference from those from the Pacific, and I was unable to detect any other difference between the animals from the North Atlantic and those from the Pacific than the anteriorly broader and much more obtuse frontal plate in the former together with their much larger size. The result of study was that I must consider the Pacific specimens as a smaller local form or variety of *T. pectinata*.— *Nematoscelis microps* G. O. S. shows also local variation in the shape of the rostrum in both sexes and especially in the males, as is seen by comparison of specimens from the Atlantic, the Indian Archipelago, and the East Pacific (comp. the "Siboga" Report and my notes on *N. microps* in the present paper).

The young specimen just described is interesting. I have stages intermediate in size and development between that small specimen and the adults, and that it belongs to this species is easily seen from its lobe of first antennular joint. The oblong, divided eye, the shape of the frontal plate and the existence of a denticle on the lateral margins of the carapace agree completely with the features found in very young specimens of *T. orientalis* H. J. H. belonging to the same group of the genus. That Illig's *Parathysanopoda foliifera* has been founded on a young specimen of *T. pectinata* is easily seen from his description and figures; the specimen, which measured 15 mm., was captured in the Atlantic, and as the adults from this Ocean are as a rule much larger than those from the

East Pacific, I think it natural that young in the same stage of development from the two Oceans differ also somewhat in size.

Distribution.— The Monaco specimens were captured in the Eastern Atlantic more or less remote from Southern Spain; Ortmann's specimen was taken in the Northern equatorial current, and Illig's young was from the Benguela current, West of Angra Pequena. The list above shows that the distribution in the East Pacific is similar to that of *T. aequalis* or *T. obtusifrons*.

8. **Thysanopoda orientalis** H. J. Hansen.

Plate 5, figs. 2a–2i.

1910. *Thysanopoda orientalis* H. J. Hansen, Siboga-Exp., **37**, p. 85, pl. 13, figs. 2a–2i.

Sta. 4709.	Dec. 30, 1904.	Lat. 10° 15.2′ S., long. 95° 40.8′ W.	300 fms. to surface. 4 specimens.
Sta. 4717.	Jan. 13, 1905.	Lat. 5° 10′ S., long. 98° 56′ W.	300 fms. to surface. 1 specimen.
Sta. 4721.	Jan. 15, 1905.	Lat. 8° 7.5′ S., long. 104° 10.5′ W.	300 fms. to surface. 1 specimen.
Sta. 4722.	Jan. 16, 1905.	Lat. 9° 31′ S., long. 106° 30.5′ W.	300 fms. to surface. 5 specimens.
Sta. 4740.	Feb. 11, 1905.	Lat. 9° 2.1′ S., long. 123° 20.1′ W.	300 fms. to surface. 1 specimen.

A description is found in the paper quoted, but notes on the maxillulae, maxillae, and copulatory organs may be added here.

The maxillulae (figs. 2a–2b) are quite similar to those in *T. obtusifrons* G. O. S., but differ in minor particulars. The proximal lobe is distally a little more rounded; the distal lobe, though increasing strongly in breadth towards the end, is almost as long as broad or a little broader than long; the palp is somewhat or considerably shorter than the distal lobe, slender; the pseudexopod is very large, yet smaller than in *T. obtusifrons*, rather far from reaching the end of the distal lobe.— The maxillae (fig. 2c) are somewhat elongate, with the terminal — the fourth — joint considerably longer than the third and more than half as long again as broad. Fig. 2c shows besides the morphological composition of a maxilla in the present order of Crustacea.

The copulatory organs (figs. 2d–2i) show various fine features. The spine-shaped process is somewhat or considerably curved, of the normal shape. The terminal process is somewhat long, moderately strong, feebly curved, tapering, seen from behind (fig. 2d), from the base to rather near the end where it widens feebly and has the end itself rounded, but seen in the main from in front (fig. 2e) the terminal part is perceived to be somewhat widened and excavated, spoon shaped. The proximal process is very long, much longer than the terminal; its short proximal part is rather thick, then it is curved nearly abruptly inwards, but no "heel" is developed, and the process forms now nearly half of a circle, with the convex side turning inwards; from the proximal bend to a little from

the end the process is slender and nearly equally thick, but the rather short distal portion is conspicuously thickened and furnished with minute teeth along one margin and with 2–4 longer teeth from the margins just before the incurved, tooth-shaped end. Fig. 2f gives the distal part of this process seen from behind and fig. 2g the same part of the same specimen seen from in front; fig. 2h represents the same part, seen from behind, of another specimen in order to show variation of the armature. The median lobe has its proximal part, from its origin to the insertion of the lateral process (p^4.), long and proportionately rather narrow, longer than the distal part; the terminal portion beyond the insertion of the usual additional process (p^5.) is an oblong, distally produced, acuminate and acute lobe (fig. 2d and fig. 2i). The lateral process (p^4.) is slender, somewhat long, curved, and with the short terminal, acute part bent inwards and forwards. The additional process (p^5.) is an oblong-oval, rather thick, yet somewhat obliquely vaulted body with the distal end produced into a small, conical, oblique, acute tooth. But a little beyond the lateral process there originates a small, very slender secondary additional process (p^6.) shaped nearly as a spine with the terminal portion bent inwards (overlooked by me in the "Siboga" material). The auxiliary lobe is of moderate size and the setiferous lobe moderately broad; the latter is furnished with setae quite as in *T. pectinata*.

Length of adult males from 23 to 27.5 mm., of the largest female from the East Pacific 24.5 mm., while a large female from the "Siboga" measured 38 mm. in length.

Distribution.— Some specimens were taken at four localities in the Indian Archipelago by the "Siboga." In 1910 the Prince of Monaco captured several fine specimens at three localities in the North Atlantic West of Southern Spain.

Group b. *Carapace with a well-developed cervical groove. Maxillulae with the pseudexopod somewhat small, scarcely or not at all overreaching the outer margin of third joint and with the palp very long. Sixth abdominal segment shorter than the fifth.*

9. **Thysanopoda cornuta** Illig.

1905, March 28. *Thysanopoda cornuta* Illig, Zool. Anz., **28**, p. 663 (with three figures in the text).
1905, April 1. *Thysanopoda insignis* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 30, p. 19 (with three text-figures).

Sta. 4670. Nov. 20, 1904. Lat. 12° 8.7′ S., long. 79° 2.4′ W. Trawl, 3209 fms. 1 specimen.

The single specimen is an extremely large female measuring 75 mm. in length, but unfortunately considerably damaged. It agrees excellently with my preliminary description and figures in the paper quoted.

Distribution.— Illig's type was taken in the tropical Atlantic, in the Benguela current off Angra Pequena, in a vertical haul from 4000 m. to surface. The Monaco specimens were captured at Lat. 27° 43′ N., long. 18° 28′ W., 3000 to 0 m., and the depth of the Station was 3817 m.— This gigantic species is certainly bathypelagic.

(?) **Thysanopoda cornuta** Illig. *Juv.*

Plate 6, figs. 1a–1e.

Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 1 specimen.

The specimen measures 14.5 mm. in length. The thoracic legs, which are well developed, shows that it belongs to the genus Thysanopoda; the shape or rather the stage of development of the maxillulae (fig. 1c) and the maxillae (fig. 1d) together with the fact that the uropods are very short in comparison with the telson (fig. 1e) proves with absolute certainty that the specimen is very young. The sixth abdominal segment is shorter than the fifth, which shows that the specimen belong to Group b of this genus. And with little doubt I consider it to be a specimen of *T. cornuta* near the end of its larval life.

Description.— The frontal plate is very large (fig. 1a) with a considerable portion of the lateral margin, subparallel, the distal outer angles rounded, the front margin very long, in the main transverse, being a little produced at the middle as a small very low triangle and the part of the margin outside this triangle distinctly concave. The median keel between the cervical groove and the front end is well developed. The integument of the carapace is somewhat thin, but the cervical groove and the lateral grooves connected with it seem to agree with my figures of the adult, while the longitudinal lateral furrows cannot be discerned; the lateral margins seem to have no real denticle.

The eyes are of moderate size, nearly black; the small process found in the adult on the outer distal angle of the eye-stalks has not yet been developed.— The antennulae (fig. 1b) show considerable similarity with those in the adult, but the basal joint is still without its upper distal lobe, and the process from the outer distal angle is long, as might be expected.— The antennal squama with a distinct tooth from the outer distal angle.— The maxillulae (fig. 1c) show larval characters; the small exopod (ex) is present, while a vestige of a pseudexopod is rudimentary; the palp (4) has certainly not yet obtained its final length and only very few of its setae.— The maxillae (fig. 1d) show the aspect as in older larvae.

The upper surface of the fourth and fifth abdominal segments show quite, as in the adults, feeble rudiments of three longitudinal keels, while the sixth segment has not yet obtained the flat dorsal excavation limited by feeble lateral carinae found in the adult.— The uropods are much shorter than the telson, a feature due to the young age of the specimen.

Remarks.— That the specimen is a young of one of the species of Group b is certain. This group comprises hitherto only two species; judging from various particulars I think the specimen studied belongs to *T. cornuta*, not to *T. egregia*. It is, of course, possible, but in my opinion very improbable, that it belongs to an otherwise hitherto unknown species.

10. **Thysanopoda egregia** H. J. Hansen.

1905. *Thysanopoda egregia* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 30, p. 22 (with two figures in the text).

Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 1 specimen.

Remarks.— The single specimen measures 27 mm. in length; it is a female and, judging from its size, probably immature, as the single other specimen hitherto known, the male in the Monaco collection, is 44 mm. long. It agrees on the whole with the description in the Monaco paper, excepting that the third antennular joint is slightly tapering in breadth towards the end and the lower flagellum simple, while in the male figured that peduncular joint is slightly thickened towards the end and the basal part of the lower flagellum much thickened and furnished with a thick tuft of thin setae. Seen from the side, the upper margin of the carapace between the dorsal organ and the front end is more convex, being towards the front end curved more downwards, than in the Monaco specimen.

Two other points may be mentioned. In the Monaco specimen a straight furrow runs along the side of the carapace considerably above the margin from the posterior margin to a little behind the cervical groove, and the upper margin of that furrow is raised and thickened so much that it looks like as a keel; in the smaller Agassiz specimen the furrow is scarcely distinct but the keel very conspicuous. In the description of the Monaco specimen I stated that the fourth to sixth abdominal segments have a dorsal keel along the posterior part of the median line of each, but there is no median keel on the sixth segment; the passage alluded to is correct as to the other particulars.

Distribution.— The single specimen previously known was captured at Lat. 30° 41′ N., long. 17° 46′ W., 2500 to 0 m.

NYCTIPHANES G. O. Sars (1883).

As the endopod of the penultimate pair of thoracic legs is long, but only two-jointed, this genus ought to find its place between Thysanopoda and Euphausia, as already stated by Ortmann in 1894. G. O. Sars established the genus on a species, *N. australis* G. O. S., from the Southeastern and Eastern coasts of Australia, and referred *Thysanopoda norvegica* M. Sars to the same genus, believing that *T. couchi* Bell possibly might be identical with the latter form. In 1905 Holt and Tattersall established the genus Meganyctiphanes on *T. norvegica*, pointing out that it differed from Nyctiphanes G. O. S., comprising *N. couchi* Bell and *N. australis* G. O. S., in the following particulars:— fifth and sixth pairs of thoracic legs with an endopod in both sexes, while an endopod on these legs is present in the male and wanting in the female; furthermore, in Nyctiphanes the antennular peduncle is "considerably stouter in the adult male than in the female", but in Meganyctiphanes the same peduncle is "scarcely, if at all" stouter in the male than in the other sex; finally, the females of Nyctiphanes carry their eggs "in paired pyriform masses," but on Meganyctiphanes ovisacs have never been found. I may add that the male copulatory organs on the first pleopods afford excellent generic characters; in Meganyctiphanes the organs are nearly as in Thysanopoda and the inner lobe short with its three processes well developed as in that genus; in Nyctiphanes (Plate 6, fig. 2h and fig. 3e) the inner lobe is quite peculiar, being extremely produced as an oblong, more or less triangular plate with the outer margin sinuate and partly serrate, and this lobe has the spine-shaped process well developed as in Meganyctiphanes, while the terminal and the proximal processes are quite wanting.

The genus Nyctiphanes comprises four species. Two species, *N. australis* G. O. S. and *N. couchi* Bell, were established in the earlier literature; in 1911 I published preliminary descriptions of the two additional species, *N. simplex* H. J. H. and *N. capensis* H. J. H. and besides I pointed out that *N. latifrons* Illig (1908) taken West of Northern Africa was established on very young specimens of *N. couchii* Bell.

The Agassiz collection contains specimens of *N. simplex* H. J. H., but for various reasons, and especially as Ortmann has referred specimens taken by Agassiz in the Pacific to *N. australis*, I redescribe also this species for comparison with *N. simplex*.

11. **Nyctiphanes simplex** H. J. Hansen.

Plate 6, figs. 2a–2i (adult and subadult); Plate 7, figs. 1a–1b (young).

1911. *Nyctiphanes simplex* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 20.

Sta. 4576. Oct. 8, 1904. Lat. 29° 52′ N., long. 116° 56′ W. Surface. 3 specimens.
Sta. 4644. Nov. 7, 1904. Lat. 2° 13.3′ S., long. 89° 42.2′ W. Surface. 1 ovigerous female and 1 young.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. { Surface. 7 immature or young specimens. 100 fms. to surface. 2 immature or young specimens.
Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. Surface. 43 specimens (18 young).
Sta. 4715. Jan. 2, 1905. Lat. 2° 40.4′ S., long. 90° 19.3′ W. 300 fms. to surface. 2 adult specimens (♂ Type, and ♀).

Description.— The frontal plate moderately long, triangular, subacute, with its margin considerably raised; and the median keel begins a little behind the tip (fig. 2a) and reaches the distinct cervical groove; the median area between the frontal plate and that groove is considerably vaulted. As in the other forms of the genus, the carapace of the adult and subadult has no denticle or angle on the lateral margin.

Eyes moderately large.— The antennular peduncles very characteristic; in both sexes the first joint is, at the outer distal corner, produced in a very conspicuous protuberance which, seen from above (figs. 2c and 2e) is directed forwards and somewhat outwards, is subconical, very thick at the base and acuminate at the end; the upper terminal leaflet is very large, directed somewhat or much backwards and considerably or a little upwards; considerably longer than broad at the base; scarcely twice as broad at the base as at the end, which is broadly rounded or nearly truncate with the terminal outer angle produced into a small triangle and frequently curved considerably upwards and forwards (fig. 2d); the upper surface of the leaflet is excavated, especially near the base; finally, outwards below the base of the leaflet a transverse, vaulted part is seen. The second joint in the female (figs. 2d and 2e) is very long, somewhat slender, with an oblique, subacute tooth at the upper distal inner angle; in the male (fig. 2b and 2c) this joint is a little shorter and conspicuously, even considerably thicker than in the female, and the upper distal tooth is much broader, subvertical, triangular, or somewhat bifid. Third joint in both sexes much shorter than second, in the female slender, somewhat keeled above towards the end and the keel terminating in a short, acute tooth (fig. 2d); in the male (figs. 2b and 2c) this joint is much thicker, without any tooth, but, seen from above, conspicuously curved, with the outer margin very convex, the inner somewhat concave and near its middle adorned with a bundle of three short and very strong setae.

In more than half-grown, but immature, specimens the leaflet of first joint is more rapidly and evenly narrowed, not truncate, but with the terminal portion produced much upwards and considerably outwards (fig. 2f), the inner margin being very convex towards the acute tip and the outer considerably concave; the tooth at the end of second joint is much longer and the acuminate part of the outer distal protuberance of the first joint considerably longer than in the adults.— The antennal squama does not reach the end of second antennular joint (fig. 2a); its terminal margin is transverse or a little oblique, with the outer denticle very distinct; the two distal joints of the stalk of the endopod are similar in both sexes.

Sixth abdominal segment with a distinct dorsal spiniform tooth at the end.

The copulatory organs (figs. 2h–2i) afford some specific characters. The distal half of the inner lobe (li.) is subtriangular, rounded at the end; the distal two thirds of the free outer margin of this lobe is serrate, and its proximal half shows two obtuse protuberances between which the margin is rather concave. The median lobe (lm.) is extremely short, cut off transversely, and from the inner part of the terminal margin the somewhat long lateral process (p^4.) projects; this process is bent a little outwards at the acute end.

Length of the largest male 11.5 mm., of the largest female 14 mm. One of Ortmann's males from the Gulf of Panama is 13.2 mm. long.

Very young Specimens[1] (Plate 7, figs. 1a–1b).— The specimen figured measures 7 mm.; other somewhat smaller specimens are at hand.— The frontal plate is at the base as broad as the carapace; it is much produced, longitudinally concave, its lateral margins are sinuate, being proximally convex and distally concave, and the plate is distally truncate, even flatly emarginate, each angle being produced in an acute tooth; at the end the plate is about one third as broad as at the base. In the largest specimen the carapace has scarcely any angle on the lateral margin somewhat before the hind margin, but in the other specimens an angle or generally a small denticle is distinct. The eyes are extremely large. The leaflet of first antennular joint in the largest specimen directed upwards and somewhat backwards, somewhat excavated above beyond the base, a little longer than broad, nearly oblong-triangular, with the inner margin straight, the outer somewhat convex, and the distal part produced in an acute tip bent upwards and somewhat forwards but not outwards; in somewhat smaller specimens the leaflet is proportionately smaller and less developed; the process from the outer distal angle of first joint very long. Second and third antennular joints in the main as in the subadult.

[1] The larvae of this species are dealt with, p. 288–290.

Remarks.— This species is allied to *N. australis* G. O. S., but differs in several features. In order to point out and illustrate these differences I have given on Plate 6 figures of the antennular peduncles of both sexes and of the copulatory organs of *N. australis*; the figures were drawn from two cotypes of Sars.

The leaflet from first joint is much smaller than in *N. simplex* and considerably broader than long (figs. 3a–3d), subtriangular, with the outer margin convex and very oblique, and it terminates in a more or less acute tip bent upwards and, in one of the specimens drawn, somewhat forwards and placed almost above the inner margin of the joint, furthermore no transverse, vaulted part is seen at the outer side below the base of the leaflet. The antennular peduncles in the male are still somewhat thicker, those of the female still more slender than in *N. simplex*. In the male (fig. 3a and 3b) a high, compressed, keel-shaped protuberance is seen near the end of second peduncular joint, and the third joint is somewhat thicker than in *N. simplex*, with about six minute hairs, but no stiff setae, on the inner side. The copulatory organs (fig. 3e) have the most distal part of the inner lobe considerably broader than in *N. simplex*, the proximal half of the outer margin of this lobe differs in the shape of the protuberances from that species, but the most important difference is shown by the median lobe (lm.), which in *N. australis* has the lateral process placed as in *N. simplex*, but the lobe itself projects along that process to its end; if this lobe had been cut off opposite the insertion of the process we would have the structure found in *N. simplex*. The female examined of *N. australis* is 13.5 mm., the male 15 mm.

Distribution.— In 1894 Ortmann (Bull. Mus. Comp. Zoöl., 25, p. 100) enumerated nine localities for *Nyctiphanes australis*:— Gulf of Panama, Galapagos, Gulf of California, and some Stations in the Northern Pacific between San Francisco, and the Hawaiian Islands. From the U. S. National Museum I have received specimens from these Stations and an examination gave the result, that the two specimens from "Survey" Sta. 54 and "Survey" Sta. 74, both Stations in the North Pacific between San Francisco and the Hawaiian Islands, are males of *Euphausia recurva* H. J. H., while the specimens from the seven other Stations belong to *N. simplex* and not to *N. australis*. The latter species is hitherto only known from the sea around the Southeastern part of Australia; in 1911 I established *N. capensis* on the specimens mentioned by Stebbing in 1905 and 1910 as taken off Cape St. Blaize, South coast of Africa, and by him referred to *N. australis*.

EUPHAUSIA Dana (1852).

Some statements on the copulatory organs of the male first pleopods in this genus may be given here. The spine-shaped process is wanting (yet I found this process developed in the normal way in one of the specimens examined of *E. lucens* H. J. H.); the terminal and the proximal processes are well developed. The median lobe is, as in Thysanopoda, separated from the inner lobe and has the lateral process strong and inserted at a considerable distance from its base, but it has generally no additional process, though this process is present as a small spine in *E. mucronata* G. O. S. and as a mere rudiment in *E. gibboides* Ortm. The auxiliary lobe is well developed, oblong; the setiferous lobe is normal, with the pouch on the posterior surface very conspicuous.

The genus comprises twenty-seven species, fourteen of which are represented in the material from the East Pacific. These species belong to three of the four groups into which I divide the genus.

Group *a*. *Species with two pairs of lateral denticles on the carapace. No dorsal process on third to fifth abdominal segment.*

12. **Euphausia eximia** H. J. Hansen.

Plate 7, figs. 2a–2g.

1911. *Euphausia eximia* H. J. Hansen, Bull. Mus. Océan. Monaco, No. 210, p. 23.

Sta. 4580.	Oct. 10, 1904.	Lat. 24° 55′ N., long. 112° 45′ W.	300 fms. to surface. 5 specimens.
Sta. 4598.	Oct. 15, 1904.	Lat. 15° 58′ N., long. 98° 13′ W.	300 fms. to surface. 2 specimens.
Sta. 4605.	Oct. 17, 1904.	Lat. 12° 21′ N., long. 92° 13′ W.	300 fms. to surface. 2 young specimens.
Sta. 4611.	Oct. 18, 1904.	Lat. 10° 33′ N., long. 88° 30′ W.	Surface. 6 specimens.
Sta. 4615.	Oct. 19, 1904.	Lat. 9° 7′ N., long. 85° 11′ W.	Surface. 5 specimens (1 large, 3 quite small).
Sta. 4619.	Oct. 20, 1904.	Lat. 7° 15′ N., long. 82° 8′ W.	Surface. 9 specimens (1 large, 8 small).
Sta. 4644.	Nov. 7, 1904.	Lat. 2° 13.3′ S., long. 89° 42.2′ W.	Surface. 29 specimens (several of which adult).
Sta. 4649.	Nov. 10, 1904.	Lat. 5° 17′ S., long. 85° 19.5′ W.	300 fms. to surface. 2 specimens.
Sta. 4650.	Nov. 10, 1904.	Lat. 5° 22′ S., long. 84° 39′ W.	300 fms. to surface. 14 specimens.
Sta. 4652.	Nov. 11, 1904.	Lat. 5° 44.7′ S., long. 82° 39.5′ W.	Surface. 74 specimens. 100 fms. to surface. 43 specimens. 200 fms. to surface. 45 specimens. 400 fms. to surface. 45 specimens.
Sta. 4655.	Nov. 12, 1904.	Lat. 5° 57.5′ S., long. 80° 50′ W.	400 fms. to surface. 18 specimens.
Sta. 4657.	Nov. 13, 1904.	Lat. 7° 12.5′ S., long. 84° 9′ W.	Surface. 1 specimen. 300 fms. to surface. 42 specimens.
Sta. 4659.	Nov. 14, 1904.	Lat. 8° 54.5′ S., long. 86° 5.5′ W.	Surface. 7 specimens. 300 fms. to surface. 80 specimens.
Sta. 4661.	Nov. 15, 1904.	Lat. 10° 17′ S., long. 88° 2′ W.	300 fms. to surface. 19 specimens.
Sta. 4663.	Nov. 16, 1904.	Lat. 11° 20.3′ S., long. 88° 55.2′ W.	300 fms. to surface. 5 specimens.
Sta. 4664.	Nov. 17, 1904.	Lat. 11° 30.3′ S., long. 87° 19′ W.	300 fms. to surface. 10 specimens.
Sta. 4665.	Nov. 17, 1904.	Lat. 11° 45′ S., long. 86° 5.2′ W.	Surface. 5 specimens. 300 fms. to surface. 46 specimens.

Sta. 4667.	Nov. 18, 1904.	Lat. 11° 59.5′ S., long. 83° 40.4′ W.	Surface. 1 specimen. 300 fms. to surface. 41 specimens.
Sta. 4668.	Nov. 19, 1904.	Lat. 12° 9.3′ S., long. 81° 45.2′ W.	Open part of Tanner net, 300 fms. to surface. 28 specimens. (Type, 1 ♂).
Sta. 4669.	Nov. 19, 1904.	Lat. 12° 12.7′ S., long. 80° 25.6′ W.	Surface. 1 specimen. 300 fms. to surface. 42 specimens.
Sta. 4671.	Nov. 20, 1904.	Lat. 12° 6.9′ S., long. 78° 28.2′ W.	Surface. 1 specimen. 300 fms. to surface. 46 specimens.
Sta. 4673.	Nov. 21, 1904.	Lat. 12° 30.5′ S., long. 77° 49.4′ W.	300 fms. to surface. 13 specimens.
Sta. 4676.	Dec. 5, 1904.	Lat. 14° 28.9′ S., long. 81° 24′ W.	300 fms. to surface. 8 specimens.
Sta. 4711.	Dec. 31, 1904.	Lat. 7° 47.5′ S., long. 94° 5.5′ W.	300 fms. to surface. 1 specimen.
Sta. 4715.	Jan. 2, 1905.	Lat. 2° 40.4′ S., long. 90° 19.3′ W.	300 fms. to surface. 11 specimens.
Sta. 4716.	Jan. 2, 1905.	Lat. 2° 18.5′ S., long. 90° 2.6′ W.	Surface. 2 specimens. 600 fms. to surface. 6 specimens.
Sta. 4719.	Jan. 14, 1905.	Lat. 6° 29.8′ S., long. 101° 16.8′ W.	300 fms. to surface. 1 specimen.
Sta. 4742.	Feb. 15, 1905.	Lat. 0° 3.4′ N., long. 117° 15.8′ W.	300 fms. to surface. 9 specimens.

Description.— The frontal plate (fig. 2a) is a very short triangle with the margins somewhat sinuate; it terminates in a well-developed, slender rostrum which is considerably or much longer than the breadth of second antennular joint. The oblong dorsal area behind the frontal plate is considerably vaulted and the keel along this area and forward to near the middle of the rostrum, is high; seen from the side with its upper margin above the area mentioned it is considerably curved and even sometimes feebly angular.

Eyes moderately large, black.— Antennular peduncles similar in both sexes, moderately robust; first joint nearly as long as the sum of the two others, seen from above (fig. 2a) a little more than twice as long as broad; the terminal lobe is a transverse plate directed forwards and upwards, at the base half as broad or more than half as broad as the end of the joint, its outer margin is directed considerably outwards, so that the terminal margin is longer than the base (fig. 2c) and this margin bears a row of 9–10 spiniform processes, the inner short, from there increasing in length outwards with those at the outer margin long and directed forwards and outwards. The second joint slightly longer than the third, its upper distal margin distinctly oblique, from near the outer side directed somewhat forwards, at a short distance from the outer margin with a rather long, a little curved, spiniform process directed essentially forwards; a little behind the terminal margin and rather near the inner margin projects another process as long as, or longer than, the first named, and it is either simple (fig. 2c) or bifurcate (fig. 2d), in the latter case terminating in two spines. Third joint with the dorsal keel occupying nearly two thirds of the upper margin; seen from the side (fig. 2b) high and, if fully developed and preserved, with the uppermost part projecting forwards as a small triangle, just below which the front margin of the keel is considerably concave.— The antennal squama reaches the

middle of the third joint of the antennular peduncles and is of very moderate breadth; the spiniform outer process from the second peduncular joint is very long, half, or more than half, as long as the squama.

The copulatory organs (figs. 2e–2g) afford good characters. The terminal process (p^2.) is somewhat long, with the foot well developed and the heel short; somewhat more than its proximal half moderately thick and straight, while its distal portion is evenly curved, gradually tapering to the acute end and curved forwards, so that its curvature must be seen from the inner side (fig. 2f); a slender, spiniform, nearly straight, acute, very thin-walled process originates where the curvature begins and does not reach the end of the main process. The proximal process (p^3.) is rather long, considerably bent somewhat from the base and a little curved slightly beyond the middle; its basal part is somewhat thickened on the outer side, the remainder moderately slender, the distal portion much flattened, seen from behind (fig. 2e) very thin towards the end; seen from the inner side (fig. 2f) with the rather short distal part somewhat expanded, forming a very oblique, distally rounded plate with the posterior margin concave, and the anterior margin very convex with a small protuberance about where the curvature begins. The median lobe with the proximal portion somewhat less than twice as broad as the part beyond the insertion of the lateral process; the most distal part of the lobe suddenly strongly expanded backwards, seen from behind (fig. 2e) therefore this expansion mainly turns its posterior edge towards the observer, while seen from the inner side (fig. 2g) the expanded part shows its form to be a broad triangle; the lateral process (p^4.) is moderately large, with the base thick and the distal part slender and broadly curved, without any dorsal tooth. The auxiliary lobe is long. The setiferous lobe has the same breadth from before the insertion of the auxiliary lobe to rather near the end which is partly truncate, partly somewhat triangularly produced, with about seven setae, while the parallel lateral margins of the lobe are naked.

Length of one of the largest specimens 20 mm., but most adult specimens are somewhat smaller, about 16–17 mm.

Remarks.— This species is allied to the two Atlantic species *E. krohnii* Brandt and *E. americana* H. J. H., but it differs from both in some good characters, derived from the antennulae and the shape of the two processes on the inner lobe of the copulatory organs. In Bull. Mus. Océan. Monaco, no. 210, I have pointed out the main differences between these three species, with outlines of the two important processes on their copulatory organs.

Distribution.— The long list of localities with the number of specimens

enumerated above proves that *E. eximia* must be extremely common in the major part of the area of the East Pacific investigated by Dr. Agassiz in 1904–1905, but yet not found South of Lat. $14\frac{1}{2}°$ S., in the whole southwestern part South of the line, towards Manga Reva, nor in the inner part of the Gulf of Panama; and not a specimen has been taken near the Fiji Islands, nor, so far as I know at present, in the tropical West Pacific.— The list shows that the species was rather frequently taken at the surface.

13. **Euphausia recurva** H. J. Hansen.

Plate 7, figs. 3a–3n.

1905. *Euphausia recurva* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 13.

Sta. 4576. Oct. 8, 1904. Lat. 29° 52′ N., long. 116° 56′ W. Surface. 24 ♂, 1 ♂ juv., 1 ♀.

Description.— The frontal plate (fig. 3a) very short and shaped as in *E. eximia*; the rostrum is very acute, shaped as a rather narrow or very narrow triangle, from a little to considerably longer than the breadth of second antennular joint; the keel from the basal part of the rostrum to the posterior end of the oblong dorsal area nearly as in *E. eximia*.

The eyes are medium sized, a little smaller than in *E. eximia*.— The antennular peduncles show interesting features. The basal joint is slightly more than twice as long as broad, as long as the sum of the two other joints, and the upper distal lobe differs extremely in the two sexes. In the male (figs. 3b and 3c) it is a very oblong-triangular plate much longer than broad, longitudinally somewhat curved so that it is less or more hollowed, at the base from a little less to a little more than half as broad as the end of the joint, at the end acute or even acuminate, directed upwards and somewhat backwards. In the female the lobe is vertical or a little recurved (figs. 3d and 3e), somewhat more than half as broad as the end of the joint, with the lateral margins subparallel, while the distal margin is deeply and more or less obliquely concave; the distal part of the lobe is therefore shaped as two triangular, acute processes either nearly equal in length or the inner somewhat or much longer than the outer, which sometimes is short. The two distal antennular joints are thicker in the male than in the female. Second joint increases somewhat in breadth from the base to considerably beyond the middle; its terminal upper margin is somewhat oblique; a little inside and behind the distal outer angle a thick, angular protuberance or short, obliquely conical tubercle is seen, while a little inside and behind the distal inner angle a slender, spiniform, acute process projects forwards

and a little upwards, and this process is sometimes even proportionately long and at least considerably longer than the outer dorsal tubercle. Third joint a little shorter than the second; its dorsal keel is very high, shaped nearly as in *E. eximia*, with the triangular, acute tooth beyond the middle and the rounded incision below that tooth well developed.— The antennal squama slightly broader than in *E. eximia*, reaching the middle of third antennular joint; the spiniform process from the antennal peduncle reaches the middle of the squama.

The copulatory organs (figs. 3f–3n) show some minor differences from those in *E. eximia*. The terminal process (figs. 3f–3h) in the main as in that species, being a little shorter and thicker, with the heel somewhat longer and the distal secondary process shorter, thicker, and obtuse. The proximal process is shorter and thicker than in *E. eximia*, with the basal third somewhat inflated on the outer side; about at the beginning of the distal third it is bent somewhat inwards, and its terminal part is, seen from behind, a flattened plate somewhat expanded on the outer (distal) side, but the end of the plate varies much in shape, even in specimens from the same locality, as is shown by four figures (figs. 3i–3n); sometimes the end is nearly cut off obliquely with the inner angle acute and feebly produced (figs. 3i and 3k), sometimes the end is deeply incised and the inner corner produced into an acute (fig. 3l) or obtuse (fig. 3n), narrow process much longer than broad, while the most distal angle formed by the terminal and the outer margin is always rounded, but sometimes nearly rectangular (figs. 3m and 3n), sometimes very obtuse (figs. 3k and 3i). The median lobe with its lateral process and the setiferous lobe nearly as in *E. eximia*; the auxiliary lobe is very long.

The specimens taken at Sta. 4576 are somewhat small, 11–12 mm., long, but the species varies much in size, and a female from Lat. 34° 50′ S., long. 25° 30′ E. measures even 18 mm. in length.

Remarks.— The male of this species is easily distinguished from all other forms of the genus by the shape and direction of the lobe from first antennular joint. In the female the shape of this lobe is to some degree similar to that in the three following species, but the female of *E. recurva* is easily separated from the other forms by the acute, slender, and spiniform process above near the distal inner angle of second antennular joint; in *E. diomedeae* Ortm. this process is replaced by a triangular protuberance, while in *E. mutica* H. J. H. and *E. brevis* H. J. H. there is no armature at the upper inner angle of second joint; finally in *E. diomedeae* and *E. mutica* the lobe from first joint is directed upwards and considerably forwards.

Distribution.— Of this species the Copenhagen Museum possesses a large mass of material from twenty-eight localities; eleven of these Stations are in the Southern Atlantic between Lat. 18° S. and Lat. 36° 10′ S., sixteen Stations are situated in a transverse belt across the southern part of the Indian Ocean between Lat. 25° 40′ S. and Lat. 40° 4′ S., and from near the southern end of Africa to about Long. 100° E.; finally one Station near Japan, viz. Lat. 31° 20′ N., long. 132° 29′ E.— It has been stated above that the specimens from "Survey" Sta. 54 (Lat. 35° 3.5′ N., long. 129° 5′ W.) and "Survey" Sta. 74 (Lat. 30° 4.5′ N., long. 133° 56.5′ W.) referred by Ortmann to *Nyctiphanes australis* are males of *E. recurva*, finally it may be stated that Ortmann's *Euphausia pellucida* Dana comprises specimens of several species, among which there are also specimens of *E. recurva*, but a revision of this material is postponed for a future paper on the Euphausiacea in the U. S. National Museum.

14. **Euphausia diomedeae** Ortmann.

Plate 7, fig. 4a.

1894. *Euphausia diomedeae* Ortmann, Bull. Mus. Comp. Zoöl., **25**, p. 102, plate, fig. 3.
1910. *Euphausia diomedeae* H. J. Hansen, Siboga-Exp., **37**, p. 91, pl. 13, figs. 4a–4e.

Sta. 4574. Oct. 8, 1904. Lat. 30° 35′ N., long. 117° 15′ W. 300 fms. to surface. 3 specimens.
Sta. 4587. Oct. 12, 1904. Lat. 20° 40′ N., long. 107° 25′ W. 300 fms. to surface. 3 specimens.
Sta. 4588. Oct. 12, 1904. Lat. 19° 52′ N., long. 106° 22′ W. Surface. 74 specimens (includ. larvae).
Sta. 4594. Oct. 14, 1904. Lat. 17° 20′ N., long. 101° 32′ W. 300 fms. to surface. 1 specimen.
Sta. 4596. Oct. 14, 1904. Lat. 16° 47′ N., long. 100° 27′ W. Surface. 2 specimens.
Sta. 4598. Oct. 15, 1904. Lat. 15° 58′ N., long. 98° 13′ W. 300 fms. to surface. 2 specimens.
Sta. 4605. Oct. 17, 1904. Lat. 12° 21′ N., long. 92° 13′ W. 300 fms. to surface. 2 specimens.
Sta. 4607. Oct. 17, 1904. Lat. 12° 00′ N., long. 91° 30′ W. Surface. 32 specimens.
Sta. 4609. Oct. 18, 1904. Lat. 11° 05′ N., long. 89° 35′ W. 300 fms. to surface. 2 specimens.
Sta. 4611. Oct. 18, 1904. Lat. 10° 33′ N., long. 88° 30′ W. Surface. 5 specimens.
Sta. 4613. Oct. 19, 1904. Lat. 9° 45′ N., long. 86° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4615. Oct. 19, 1904. Lat. 9° 7′ N., long. 85° 11′ W. Surface. 1 specimen.
Sta. 4619. Oct. 20, 1904. Lat. 7° 15′ N., long. 82° 8′ W. Surface. Several hundred specimens.
Sta. 4634. Nov. 4, 1904. Lat. 4° 35.4′ N., long. 83° 32.3′ W. 300 fms. to surface. 20 specimens (2 of which are larvae).
Sta. 4635. Nov. 4, 1904. Lat. 3° 52.5′ N., long. 84° 14.3′ W. Surface. 106 specimens plus 112 young and larvae.
Sta. 4637. Nov. 5, 1904. Lat. 1° 31′ N., long. 86° 32′ W. 300 fms. to surface. 55 specimens.
Sta. 4638. Nov. 6, 1904. Lat. 0° 27′ N., long. 87° 13′ W. 300 fms. to surface. 5 specimens.
Sta. 4640. Nov. 6, 1904. Lat. 0° 39.4′ S., long. 88° 11′ W. Surface. More than a hundred specimens.
Sta. 4644. Nov. 7, 1904. Lat. 2° 13.3′ S., long. 89° 42.2′ W. Surface. 63 specimens.
Sta. 4646. Nov. 8, 1904. Lat. 4° 1.6′ S., long. 89° 16.3′ W. { Surface. 2 specimens. / 300 fms. to surface. 6 specimens (2 of which are larvae).
Sta. 4648. Nov. 9, 1904. Lat. 4° 43′ S., long. 87° 7.5′ W Surface. 3 specimens.
Sta. 4649. Nov. 10, 1904. Lat. 5° 17′ S., long. 85° 19.5 ′W. 300 fms. to surface. 2 specimens.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. 100 fms. to surface. 2 specimens.
Sta. 4659. Nov. 14, 1904. Lat. 8° 54.5′ S., lat. 86° 5.5′ W. { Surface. 1 specimen. / 300 fms. to surface. 1 specimen.
Sta. 4665. Nov.17, 1904. Lat. 11° 45′ S., long. 80° 5.2′ W. 300 fms. to surface. 1 specimen.

Sta. 4706. Dec. 28, 1904. Lat. 14° 18.7′ S., long. 98° 45.8′ W. Surface. 4 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 33.2′ S., long. 97° 42′ W. 300 fms. to surface. 6 specimens.
Sta. 4708. Dec. 29, 1904. Lat. 11° 40′ S., long. 96° 55′ W. Surface. 13 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 25 specimens.
Sta. 4710. Dec. 30, 1904. Lat. 9° 30.5′ S., long. 95° 8.3′ W. Surface. 119 specimens (107 of which are pulli or larvae).
Sta. 4712. Dec. 31, 1904. Lat. 7° 5′ S., long. 93° 35.5′ W. Surface. 7 specimens.
Sta. 4713. Jan. 1, 1905. Lat. 5° 35.3′ S., long. 92° 21.6′ W. 300 fms. to surface. 4 specimens.
Sta. 4714. Jan. 1, 1905. Lat. 4° 19′ S., long. 91° 28.5′ W. Surface. 5 specimens.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. Surface. 4 specimens.
Sta. 4717. Jan. 13, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 5 specimens.
Sta. 4720. Jan. 14, 1905. Lat. 7° 13.3′ S., long. 102° 31.5′ W. Surface. 1 specimen.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 17 specimens.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 11 specimens.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 1 specimen.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 12 specimens.
Sta. 4743. Feb. 15, 1905. Lat. 0° 21.3′ N., long. 117° 2.6′ W. Surface. 8 specimens.

Furthermore the species was taken by two earlier expeditions.

Fiji Isl. Dec. 11, 1897. 6 m. South of Suva lightship. 3 specimens. A. Agassiz.
Fiji Isl. Dec. 11, 1897. 3 m. South of Suva lightship. 2 specimens. A. Agassiz.
Hyd. Sta. 3789. Sept. 9, 1899. Lat. 2° 38′ N., long. 137° 22′ W. Surface. 39 specimens. "Albatross."

It may be added that specimens with the frontal plate more or less expanded, thus the typical *E. diomedeae* sens. Ortmann, were found among the material from the following Stations: — 4619, 4635, 4721, and 4742.

To the description given in the "Siboga" Report a few notes may be added. The figure of the anterior part of an animal of the typical *E. diomedeae* Ortmann exhibits the enormous expansion of the frontal plate with the reduced rostrum. The great majority of the "Albatross" specimens agree completely with the "Siboga" specimens in having the short frontal plate developed nearly as in *E. recurva*, and the rostrum slender and about as long as the distal joint of the eye-stalks, but in some few specimens, most of them males, the frontal plate is quite enormous, very long and extremely broad, covering almost totally the eye-stalks; while the rostrum is very short, the plate has the front margin semicircular, and its surface is somewhat vaulted above each eye-stalk. Some other specimens show the frontal plate and the rostrum intermediate in size and shape between the two kinds of specimens mentioned; among the large number of specimens from Sta. 4619 I have found scarcely half a score showing every stage between the common form with the short and small frontal plate and a form similar to that exhibited in fig. 4a. In all other features and in the structure of the copulatory organs the specimens with the greatly expanded frontal plate agree completely with the common form. Ortmann established his *E. diomedeae* on a couple of specimens with the frontal plate exceedingly large, but according to my experience I must consider this development as an anomaly, taking

the common form as the normal. And a similar instance in another species may be mentioned for comparison. Among a good number of *Euphausia triacantha* Holt and Tattersall secured by the Swedish Antarctic Expedition I have found a single specimen, an adult female, having the frontal plate much longer and very considerably broader and the rostrum much shorter than in the other specimens, excepting one which shows in a feeble degree the development mentioned.

The keel on the upper side of third antennular joint is moderately high, rounded above on the highest point towards the distal end, and rarely with a trace of the anterior incision found in the two preceding species.

A single specimen (from Sta. 4713) is somewhat larger than all others, 18 mm. long; many specimens measure 13–14 mm. in length, but the majority of the adults only 10–12 mm.

Distribution.— The species is unknown from the Atlantic. The Copenhagen Museum possesses specimens from a dozen localities, viz.: — The Red Sea, from Lat. 8° 1′ S., long. 83° 51′ E.; West of Cape Comorin; the Bay of Bengal, and in the South Chinese Sea eastwards and northwards to Lat. 19° 14′ N., long. 116° 16′ E.; it is common in the East Indian Archipelago ("Siboga"). Ortmann's types were taken at the Bindloe Island, Galapagos. The list shows that the species is very common in the area explored in 1904–1905 excepting in the southeastern part (from Sta. 4666 to Sta. 4705) and the southwestern part (from Sta. 4733 to Sta. 4741) where it was entirely absent.

The very long list of localities from the Agassiz Expedition shows that this species has frequently been taken at the surface, sometimes even in large numbers. The Copenhagen material has certainly all been taken near the surface.

15. **Euphausia mutica** H. J. Hansen.

1905. *Euphausia mutica* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 14 (partim).
1910. *Euphausia mutica* H. J. Hansen, Siboga-Exp., **37**, p. 93, pl. 19, figs. 1a–1d.

Sta. 4678. Dec. 6, 1904. Lat. 16° 31.2′ S., long. 85° 3.8′ W. Surface. 1 specimen.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 3 specimens.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 21 specimens.
Sta. 4682. Dec. 8, 1904. Lat. 19° 7.6′ S., long. 90° 10.6′ W. Surface. 11 specimens.
Sta. 4683. Dec. 9, 1904. Lat. 20° 2.4′ S., long. 91° 52.5′ W. 300 fms. to surface. 5 specimens.
Sta. 4700. Dec. 25, 1904. Lat. 20° 28.8′ S., long. 103° 26.3′ W. Surface. 1 specimen.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 1 specimen.
Sta. 4702. Dec. 26, 1904. Lat. 18° 39.5′ S., long. 102° W. Surface. 2 specimens.
Sta. 4703. Dec. 27, 1904. Lat. 17° 18.6′ S., long. 100° 52.3′ W. 300 fms. to surface. 2 specimens.
Sta. 4704. Dec. 27, 1904. Lat. 16° 55.3′ S., long. 100° 24.6′ W. Surface. 28 specimens.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 8 specimens.
Sta. 4706. Dec. 28, 1904. Lat. 14° 18.7′ S., long. 98° 45.8′ W. Surface. 13 specimens.
Sta. 4723. Jan. 16, 1905. Lat. 10° 14.3′ S., long. 107° 45.5′ W. Surface. 2 specimens.

Sta. 4724. Jan. 18, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 13 specimens.
Sta. 4725. Jan. 17, 1905. Lat. 11° 38.3′ S., long. 110° 5′ W. Surface. 4 specimens.
Sta. 4727. Jan. 18, 1905. Lat. 13° 3′ S., long. 112° 44.9′ W. Surface. 10 specimens.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 27 specimens.
Sta. 4729. Jan. 19, 1905. Lat. 14° 15′ S., long. 115° 13′ W. Surface. 13 specimens.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 19 specimens.
Sta. 4731. Jan. 20, 1905. Lat. 15° 47.2′ S., long. 118° 22.5′ W. Surface. 4 specimens.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 2 specimens.
Sta. 4733. Jan. 21, 1905. Lat. 16° 57.4′ S., long. 120° 48′ W. Surface. 7 specimens.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 2 specimens.
Sta. 4735. Jan. 22, 1905. Lat. 18° 16′ S., long. 123° 34.4′ W. Surface. 6 specimens.
Sta. 4736. Jan. 23, 1905. Lat. 19° 0.4′ S., long. 125° 5.4′ W. 300 fms. to surface. 2 specimens.

Finally from the following Station:—

Hyd. Sta. 3998 (236). Jan. 28, 1900. Lat. 6° 34′ N., long. 170° 59 E. Surface. Electric light. 6 specimens. "Albatross."

Remarks.— To the description in the "Siboga" paper may be added, that the dorsal keel on the third antennular joint is medium sized, with its feebly rounded distal angle about 100° and the front margin subvertical or distinctly oblique.

One of the largest specimens measures 13 mm. in length; most of the adults are about 10–12 mm., sometimes even only 8–9 mm.

Distribution.— This species is more widely distributed than the allied *E. diomedeae*, but the number of specimens seen by me of *E. mutica* is yet much smaller than the number of the other species. In the tropical East Pacific the two species were seldom taken together or at localities near each other, *E. mutica* being restricted to the southern part of the area explored, not being found North of Lat. 10° 14′ S., while in the major portion of this southern part *E. diomedeae* was entirely wanting.— *E. mutica* has been taken by the Prince of Monaco in the Sargasso Sea at Sta. 137 and Sta. 142 (West of Long. 40° W., South of Lat. 42° N.) and the Copenhagen Museum possesses specimens from the following places in the Atlantic:— Lat. 39° 30′ N., long. 50° W.; Lat. 33° N., long. 47° W.; Lat. 24° N., long. 22° W.; the West Indies; the Guinea current, finally Lat. 38° S., long. 12° E. Furthermore the Copenhagen Museum possesses specimens from the Indian Ocean about at Lat. 23° S., long. 81½° E., from the South Chinese Sea: Lat. 19° 14′ N., long. 116° 6′ E., and from Japan: Lat. 31° 20′ N., long. 132° 29′ E. The "Siboga" captured some specimens at two Stations in the Indian Archipelago.— The species has very frequently been taken at the surface.

16. **Euphausia brevis** H. J. Hansen.

Plate 8, figs. 1a–1g.

1905. *Euphausia brevis* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 15.

Sta. 4685.	Dec. 10, 1904.	Lat. 21° 36.2′ S., long. 94° 56′ W.	300 fms. to surface. 13 specimens.
Sta. 4686.	Dec. 10, 1904.	Lat. 22° 2′ S., long. 95° 52′ W.	Surface. 31 specimens.
Sta. 4687.	Dec. 11, 1904.	Lat. 22° 49.5′ S., long. 97° 30.6′ W.	300 fms. to surface. 16 specimens. 2125 fms. to surface. 7 specimens.
Sta. 4688.	Dec. 11, 1904.	Lat. 23° 17.2′ S., long. 98° 37.5′ W.	Surface. 7 specimens.
Sta. 4689.	Dec. 12, 1904.	Lat. 24° 5′ S., long. 100° 20′ W.	300 fms. to surface. 21 specimens.
Sta. 4690.	Dec. 12, 1904.	Lat. 24° 45′ S., long. 101° 45′ W.	Surface. 11 specimens.
Sta. 4691.	Dec. 13, 1904.	Lat. 25° 27.3′ S., long. 103° 29.3′ W.	300 fms. to surface. 17 specimens.
Sta. 4692.	Dec. 13, 1904.	Lat. 25° 40.4′ S., long. 104° 1.3′ W.	Surface. 1 specimen.
Sta. 4694.	Dec. 22, 1904.	Lat. 26° 34′ S., long. 108° 57.3′ W.	Surface. 11 specimens.
Sta. 4695.	Dec. 23, 1904.	Lat. 25° 22.4′ S., long. 107° 45′ W.	300 fms. to surface. 4 specimens.
Sta. 4696.	Dec. 23, 1904.	Lat. 24° 40.3′ S., long. 107° 5.3′ W.	Surface. 1 specimen.
Sta. 4698.	Dec. 24, 1904.	Lat. 22° 50.4′ S., long. 105° 31.7′ W.	Surface. 10 specimens.
Sta. 4699.	Dec. 25, 1904.	Lat. 21° 39.5′ S., long. 104° 29.8′ W.	300 fms. to surface. 2 specimens.
Sta. 4700.	Dec. 25, 1904.	Lat. 20° 28.8′ S., long. 103° 26.3′ W.	Surface. 9 specimens.
Sta. 4701.	Dec. 26, 1904.	Lat. 19° 11.5′ S., long. 102° 24′ W.	300 fms. to surface. 1 specimen.
Sta. 4702.	Dec. 26, 1904.	Lat. 18° 39.5′ S., long. 102° W.	Surface. 11 specimens.
Sta. 4730.	Jan. 20, 1905.	Lat. 15° 7′ S., long. 117° 1.2′ W.	300 fms. to surface. 3 specimens.
Sta. 4734.	Jan. 22, 1905.	Lat. 17° 36′ S., long. 122° 35.6′ W.	300 fms. to surface. 1 specimen.
Sta. 4735.	Jan. 22, 1905.	Lat. 18° 16′ S., long. 123° 34.4′ W.	Surface. 33 specimens.
Sta. 4736.	Jan. 23, 1905.	Lat. 19° 04′ S., long. 125° 5.4′ W.	300 fms. to surface. 10 specimens.
Sta. 4738.	Jan. 24, 1905.	Lat. 20° 26.5′ S., long. 128° 30.2′ W.	Surface. 21 specimens.

Description.— The frontal plate is broad and moderately long (fig. 1a), proportionately broader and conspicuously longer than in the four preceding species, with the lateral margins nearly straight or feebly sinuate, terminating in a small or very small, very oblong-triangular rostrum somewhat or much shorter than the breadth of second antennular joint. The median area behind the frontal plate is much vaulted; the keel from the basal part of the rostrum to the hind margin of the area named is well developed.

Eyes very distinctly smaller than in *E. eximia*, brown or blackish brown, thus lighter than in the four preceding species.— The antennular peduncles comparatively thick, similar in both sexes. The first joint distinctly less than twice as long as broad; its terminal lobe is directed vertically upwards or upwards and somewhat forwards, it is about half as broad as the end of the joint, broader than high, with the terminal margin more or less deeply and obliquely concave, the distal inner part being triangular, somewhat produced and its angle terminating in an acute point or short, spiniform process, while its outer distal angle is produced into a somewhat longer, subspiniform process (fig. 1c); frequently the concave distal margin shows a tiny, angular projection usually terminating in a short seta. Second peduncular joint with a proportionately rather long, spiniform process originating above from the distal margin somewhat inside

the outer margin and directed forwards and a little outwards (fig. 1c), while there is no trace of any corresponding distal process or tubercle above near the inner margin. Third joint slightly longer than second; its dorsal keel only half as long as the joint, seen from above less sharp (fig. 1a) and seen from the side only moderately high (fig. 1b), very obliquely triangular, with the distal upper angle obtuse.— The antennal squama reaches nearly or not fully the middle of third antennular joint and is proportionately broader than in *E. recurva* or *E. eximia*; the spiniform process from the subbasal joint reaches the middle of the squama.

The copulatory organs (figs. 1d–1g) are somewhat similar to those of *E. eximia*, but all three processes are proportionately shorter and show besides minor differences. The terminal process has its distal part shorter and much less curved (fig. 1g), with its spiniform appendage rather short. The proximal process is considerably shorter and proximally more inflated (fig. 1e) and beyond the middle more curved than in *E. eximia*; its distal fourth is an oblong, at the end, rounded plate (fig. 1f) bent considerably backwards, and at its base a narrowly triangular protuberance projects forwards; the real length of this plate is shown by fig. 1e, while fig. 1f exhibits the inner lobe with its two processes seen from the inner side, and owing to the very oblique direction of the terminal plate of the proximal process that plate looks in this figure much shorter than in the lateral view. The lateral process has its curved part shorter than in *E. eximia*, but as in this species without any dorsal teeth. The auxiliary lobe is moderately long; the obliquely triangular terminal part of the setiferous lobe is somewhat more produced than in *E. eximia*.

Length of adult specimens 8.5–10 mm.

Remarks.— *E. brevis* is easily distinguished from the other species of this group by its longer frontal plate with the rostrum short, by the shape of the lobe of first antennular joint and especially by having above on the second antennular joint a most conspicuous, slender process near the distal outer angle but no trace of any process or tubercle at the inner angle.

Distribution.— The distribution of *E. brevis* differs very little from that of *E. mutica*. In the tropical East Pacific it is confined to a still smaller southern area than *E. mutica* as it was not found North of Lat. 15° 7′ S., and the majority of the Stations are South of Lat. 20° S.— It is not known from near the Western coast of Europe, but the Prince of Monaco has captured it in the Sargasso Sea in Lat. $40\frac{3}{4}°$—$41\frac{2}{3}°$ N., long. 40°–$41\frac{2}{3}°$ W., and several times in the triangle, the "Banc de Goringe," the Azores, and the Canary Islands; besides in the Medi-

terranean. The Copenhagen Museum possesses specimens from four localities in the North Atlantic: — Lat. 37° N., long. 41° W.; Lat. 33° N., long. 47° W.; Lat. 24° N., long. 22° W., and Lat. 23° 31′ N., long. 22° 4′ W.; furthermore from one place in the South Atlantic: — Lat. 22½° S., long. 29½° W., from one in the Southern part of the Indian Ocean about at Lat. 23° S., long. 81½° E., finally from a place at Japan: — Lat. 31° 20′ S., long. 132° 29′ E. — Most of the specimens recorded have been taken at the surface.

Group b. *Species with a single pair of lateral denticles on the carapace. No dorsal process on third to fifth abdominal segment.*

17. **Euphausia pacifica** H. J. Hansen.

Plate 7, figs. 5a–5b.

1911. *Euphausia pacifica* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 28 (with two figures in the text).

Sta. 4571. Oct. 7, 1904. Lat. 33° 40′ N., long. 119° 35′ W. { 4 fms., surface net. 1 immature specimen. / 300 fms. to surface. 28 immature specimens.

Description.— The frontal plate is extremely short, without any real rostral process, but at the middle feebly produced as a triangle several times broader than long, with the vertex in the adults generally rounded, rarely acute, in immature specimens rounded or acute.

The eyes are extremely large; the distal joint of the stalks short. — The antennular peduncles are somewhat long, more slender in immature specimens (fig. 5a) than in adults; lobe of first joint is in the adults a small, oblong-triangular, acuminate, and acute process; in specimens a little more than half grown it is somewhat shorter in proportion to breadth (fig. 5b). Second joint is distinctly longer than the third, with the inner distal angle on the upper surface a little produced, acute.

The copulatory organs afford excellent specific characters, but as all specimens in the Agassiz collection are far from adult I have not figured these organs; in the recently published description of this species, quoted above, I have given a preliminary representation of the organs and may now refer to that paper.

One of the largest specimens in the Agassiz collection is only a little more than half-grown and measures 11 mm. in length, while adults are generally 18–22 mm. long.

Remarks.— This species is closely allied and similar to *E. lucens* H. J. H. (= *E. splendens* sens. G. O. S.), but it is well distinguished by a few small char-

acters and especially by the copulatory organs. The antennular peduncles are a little longer and distinctly more slender than in *E. lucens*, with the second joint longer than the third, while in *E. lucens* it is not longer than the third; finally the lobe of first joint is a little less conspicuous than in *E. lucens* and differs slightly in shape. The rostrum, viz. the triangle at the middle of the front margin of the carapace, is generally more pronounced and more produced in *E. lucens* than in *E. pacifica*. And the copulatory organs afford excellent characters, but here I will only refer to the brief descriptions with figures of the most important parts of the copulatory organs of *E. pacifica*, *E. lucens*, and a third closely allied species, *E. frigida* H. J. H., found in my above-mentioned paper.

Distribution.— The species is distributed in the temperate and boreal North Pacific; it is very common at Japan. The Copenhagen Museum possesses considerable material from seven localities at Formosa and especially from near Japan and Corea northwards to Lat. 39° N.; a future report on the fine material belonging to the U. S. Nat. Museum will contain a fuller account of its distribution. But here it may be stated that the specimens from four localities in the North Pacific — between Lat. 35° 19½′ N. and Lat. 35° 36½′ N., long. 125° 21½′ W. and 124° 45½′ W.— referred by Ortmann (in his paper in 1894) to *Euphausia splendens* Dana belong to *E. pacifica*.

18. **Euphausia tenera** H. J. Hansen.

1885. *Euphausia gracilis* G. O. Sars, Challenger Rept., **13**, p. 89, pl. 15, figs. 12–23 (not *E. gracilis* Dana).
1905. *Euphausia tenera* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 42, p. 9.
1910. *Euphausia tenera* H. J. Hansen, Siboga-Exp., **37**, p. 95, pl. 14, figs. 3a–3e.

Sta. 4587.	Oct. 12, 1904.	Lat. 20° 42′ N., long. 107° 25′ W.	300 fms. to surface.	7 specimens.
Sta. 4588.	Oct. 12, 1904.	Lat. 19° 52′ N., long. 106° 22′ W.	Surface.	59 specimens.
Sta. 4596.	Oct. 14, 1904.	Lat. 16° 47′ N., long. 100° 27′ W.	Surface.	5 specimens.
Sta. 4598.	Oct. 15, 1904.	Lat. 15° 58′ N., long. 98° 13′ W.	300 fms. to surface.	1 specimen.
Sta. 4619.	Oct. 20, 1904.	Lat. 7° 15′ N., long. 82° 8′ W.	Surface.	1 specimen.
Sta. 4634.	Nov. 4, 1904.	Lat. 4° 35.4′ N., long. 83° 32.3′ W.	300 fms. to surface.	1 specimen.
Sta. 4635.	Nov. 4, 1904.	Lat. 3° 52.5′ N., long. 84° 14.3′ W.	Surface.	5 specimens.
Sta. 4637.	Nov. 5, 1904.	Lat. 1° 31′ N., long. 86° 32′ W.	300 fms. to surface.	27 specimens.
Sta. 4638.	Nov. 6, 1904.	Lat. 0° 27′ N., long. 87° 13′ W.	300 fms. to surface.	21 specimens.
Sta. 4640.	Nov. 6, 1904.	Lat. 0° 39.4′ S., long. 88° 11′ W.	Surface.	134 specimens.
Sta. 4644.	Nov. 7, 1904.	Lat. 2° 13.3′ S., long. 89° 42.2′ W.	Surface.	22 specimens.
Sta. 4646.	Nov. 8, 1904.	Lat. 4° 1.6′ S., long. 89° 16.3′ W.	Surface. 87 specimens. 300 fms. to surface. 14 specimens.	
Sta. 4648.	Nov. 9, 1904.	Lat. 4° 43′ S., long. 87° 7.5′ W.	Surface.	10 specimens.
Sta. 4649.	Nov. 10, 1904.	Lat. 5° 17′ S., long. 85° 19.5′ W.	300 fms. to surface.	1 specimen.
Sta. 4650.	Nov. 10, 1904.	Lat. 5° 22′ S., long. 84° 39′ W.	300 fms. to surface.	11 specimens.
Sta. 4652.	Nov. 11, 1904.	Lat. 5° 44.7′ S., long. 82° 39.5′ W.	Surface. 5 specimens. 200 fms. to surface. 1 specimen.	
Sta. 4657.	Nov. 13, 1904.	Lat. 7° 12.5′ S., long. 81° 9′ W.	300 fms. to surface.	4 specimens.
Sta. 4659.	Nov. 14, 1904.	Lat. 8° 54.5′ S., long. 86° 5.5′ W.	Surface. 2 specimens. 300 fms. to surface. 4 specimens.	

Sta. 4661. Nov. 15, 1904. Lat. 10° 17′ S., long. 88° 2′ W. { Surface. 1 specimen. / 300 fms. to surface. 9 specimens.
Sta. 4663. Nov. 16, 1904. Lat. 11° 20.3′ S., long. 88° 55.2′ W. 300 fms. to surface. 14 specimens.
Sta. 4664. Nov. 17, 1904. Lat. 11° 30.3′ S., long. 87° 19′ W. 300 fms. to surface. 1 specimen.
Sta. 4665. Nov. 17, 1904. Lat. 11° 45′ S., long. 86° 5.2′ W. 300 fms. to surface. 64 specimens.
Sta. 4667. Nov. 18, 1904. Lat. 11° 59.5′ S., long. 83° 40.4′ W. { Surface. 1 specimen. / 300 fms. to surface. 3 specimens.
Sta. 4668. Nov. 19, 1904. Lat. 12° 9.3′ S., long. 81° 45.2′ W. Open part of Tanner net: 300 fms. to surface. 10 specimens.
Sta. 4669. Nov. 19, 1904. Lat. 12° 12.7′ S., long. 80° 25.6′ W. { Surface. 1 specimen. / 300 fms. to surface. 25 specimens.
Sta. 4671. Nov. 20, 1904. Lat. 12° 6.9′ S., long. 78° 28.2′ W. 300 fms. to surface. 6 specimens.
Sta. 4673. Nov. 21, 1904. Lat. 12° 30.5′ S., long. 77° 49.4′ W. 300 fms. to surface. 2 specimens.
Sta. 4676. Dec. 5, 1904. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 2 specimens.
Sta. 4678. Dec. 6, 1904. Lat. 16° 31.2′ S., long. 85° 3.8′ W. Surface. 20 specimens.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 10 specimens.
Sta. 4680. Dec. 7, 1904. Lat. 17° 55′ S., long. 87° 42′ W. Surface. 8 specimens.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 13 specimens.
Sta. 4683. Dec. 9, 1904. Lat. 20° 2.4′ S., long. 91° 52.5′ W. 300 fms. to surface. 4 specimens.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 1 specimen.
Sta. 4702. Dec. 26, 1904. Lat. 18° 39.5′ S., long. 102° W. Surface. 1 specimen.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 2 specimens.
Sta. 4706. Dec. 28, 1904. Lat. 14° 18.7′ S., long. 98° 45.8′ W. Surface. 1 specimen.
Sta. 4707. Dec. 29, 1904. Lat. 12° 33.2′ S., long. 97° 42′ W. 300 fms. to surface. 2 specimens.
Sta. 4708. Dec. 29, 1904. Lat. 11° 40′ S., long. 96° 55′ W. Surface. 4 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 45.8′ W. 300 fms. to surface. 4 specimens.
Sta. 4710. Dec. 30, 1904. Lat. 9° 30.5′ S., long. 95° 8.3′ W. Surface. 2 specimens.
Sta. 4712. Dec. 31, 1904. Lat. 7° 5′ S., long. 93° 35.5′ W. Surface. 1 specimen.
Sta. 4713. Jan. 1, 1905. Lat. 5° 35.3′ S., long. 92° 21.6′ W. 300 fms. to surface. 4 specimens.
Sta. 4714. Jan. 1, 1905. Lat. 4° 19′ S., long. 91° 28.5′ W. Surface. 23 specimens.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. Surface. 25 specimens.
Sta. 4717. Jan. 13, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 1 specimen.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 3 specimens.
Sta. 4723. Jan. 16, 1905. Lat. 10° 14.3′ S., long. 107° 45.5′ W. Surface. 5 specimens.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 103 specimens.
Sta. 4725. Jan. 17, 1905. Lat. 11° 38.3′ S., long. 110° 5′ W. Surface. 1 specimen.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 26.1′ W. 300 fms. to surface. 11 specimens.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 7 specimens.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 1 specimen.
Sta. 4733. Jan. 21, 1905. Lat. 16° 57.4′ S., long. 120° 48′ W. Surface. 1 specimen.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 52 specimens.
Sta. 4735. Jan. 22, 1905. Lat. 18° 16′ S., long. 123° 34.4′ W. Surface. 4 specimens.
Sta. 4736. Jan. 23, 1905. Lat. 19° 0.4′ S., long. 125° 5.4′ W. 300 fms. to surface. 20 specimens.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 12 specimens (7 of which are larvae).
Sta. 4741. Feb. 11, 1905. Lat. 8° 29.7′ S., long. 122° 56′ W. Surface. 12 specimens.
Sta. 4743. Feb. 20, 1905. Lat. 8° 52.2′ N., long. 108° 54′ W. Surface. 2 specimens.

Furthermore the species was taken by an earlier expedition at two places: —

Hyd. Sta. 3789. Sept. 9, 1899. Lat. 2° 38′ N., long. 137° 22′ W. Surface. 4 specimens. "Albatross."
Hyd. Sta. 3998 (236). Jan. 28, 1900. Lat. 6° 34′ N., long. 170° 59′ E. Surface. Electric light. 2 specimens. "Albatross."

The representation given by Sars together with the additional notes and figures in the "Siboga" Report may convey a sufficient idea of this small and very slender species.

Distribution.— The long list of Stations shows that this species is extremely common in the major part of the area investigated, viz. in its most tropical belt, being entirely wanting in the portions South of Lat. 20° S. and North of Lat. 20° 42′ N. According to Sars it has once been taken rather southwards, viz. off Port Jackson, about at Lat. 33½° S. It is common in the Indian Archipelago ("Challenger," "Siboga") and the Copenhagen Museum possesses a specimen from the Southern Chinese Sea at Lat. 19° 14′ N., long. 116° 16′ E. Finally it is common in the tropical Atlantic, going northwards at least to Lat. 24° N. (Ortmann, and specimens in the Copenhagen Museum from almost twenty localities).

The species has frequently been taken at the surface. But it may be mentioned that according to Ortmann the German Plankton-Expedition has captured the species twice in the closing net from 1200 to 1000 m. and from 700 to 500 m., thus proving that at least sometimes it goes down to a very considerable depth.

Group c. *Species with a single pair of lateral denticles on the carapace. A protruding, acute dorsal process on third abdominal segment but without any dorsal process — at most with a minute denticle (E. mucronata) — on fourth and fifth abdominal segments.*

19. **Euphausia gibba** G. O. Sars.

Plate 8, figs. 2a–2b.

1883. *Euphausia gibba* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 17.
1885. *Euphausia gibba* G. O. Sars, Challenger Rept., **13**, p. 91, pl. 16, figs. 1–8.
1911. *Euphausia gibba* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 31. (With figure).

Sta. 4683.	Dec. 9, 1904.	Lat. 20° 2.4′ S., long. 91° 52.5′ W.	300 fms. to surface. 7 specimens.
Sta. 4685.	Dec. 10, 1904.	Lat. 21° 36.2′ S., long. 94° 56′ W.	300 fms. to surface. 2 specimens.
Sta. 4686.	Dec. 10, 1904.	Lat. 22° 2.2′ S., long. 95° 52′ W.	Surface. 1 specimen.
Sta. 4687.	Dec. 11, 1904.	Lat. 22° 49.5′ S., long. 97° 30.6′ W.	300 fms. to surface. 6 specimens. 2125 fms. to surface. 1 specimen.
Sta. 4695.	Dec. 23, 1904.	Lat. 25° 22.4′ S., long. 107° 45′ W.	300 fms. to surface. 1 specimen.
Sta. 4696.	Dec. 23, 1904.	Lat. 24° 40.3′ S., long. 107° 5.3′ W.	Surface. 5 specimens.
Sta. 4698.	Dec. 24, 1904.	Lat. 22° 50.4′ S., long. 105° 31.7′ W.	Surface. 14 specimens.
Sta. 4700.	Dec. 25, 1904.	Lat. 20° 28.8′ S., long. 103° 26.3′ W.	Surface. 1 specimen.
Sta. 4701.	Dec. 26, 1904.	Lat. 19° 11.5′ S., long. 102° 24′ W.	300 fms. to surface. 12 specimens.
Sta. 4702.	Dec. 26, 1904.	Lat. 18° 39.5′ S., long. 102° W.	Surface. 7 specimens.
Sta. 4704.	Dec. 27, 1904.	Lat. 16° 55.3′ S., long. 100° 24.6′ W.	300 fms. to surface. 2 specimens.
Sta. 4732.	Jan. 21, 1905.	Lat. 16° 32.5′ S., long. 119° 59′ W.	300 fms. to surface. 1 specimen.
Sta. 4735.	Jan. 22, 1905.	Lat. 18° 16′ S., long. 123° 34.4′ W.	Surface. 2 specimens.

Description.— Body slender.— Frontal plate very short, rostrum oblong-triangular, somewhat acuminate and very acute, about as long as, or a little longer than, the breadth of the second antennular joint and not quite or about

as long as the diameter of the small eyes; the gastric area, seen from the side, somewhat feebly vaulted, and the median keel is well developed.

Lobe from first antennular joint not half as broad as the end of the joint, directed obliquely forwards, upwards, and somewhat outwards; not quite as long as broad, somewhat oblique-triangular with the inner margin feebly convex; the end very acute, and besides frequently with an extremely low tooth or feebly produced, sharp angle near the base of the outer side. Second antennular joint above with the distal inner angle showing an extremely small, sharp tooth; while at the outer side the lateral corner itself is rounded. Third joint, seen from the outer side (fig. 2a), with the dorsal keel decreasing gradually in height from the middle to its proximal end which is situated at some distance from the end of second joint, thus nearly as in *E. paragibba* H. J. H., but the distal part of the keel is a little higher than in the latter species.

Dorsal process of third abdominal segment, seen from above, shaped as an oblong-triangular, distally acuminate and acute plate, very far from half as long as the fourth segment. Sixth abdominal segment as in *E. paragibba*.

The copulatory organs (fig. 2b) differ extremely from those in all other species of the genus. The terminal process (p^2.) is unusually small, subconical, thick at the base, and with the distal third slender, acute and suddenly bent obliquely forwards and outwards; the heel is proportionately long and very slender. The proximal process (p^3.) is very long and strong, thickened at the base and then tapering nearly evenly to the acute end; somewhat before its middle it is curved somewhat inwards; and somewhat beyond the middle it is bent considerably outwards and besides forwards, its distal third being almost straight. The lateral process (p^4.) is bent strongly inwards a little before the middle; its proximal part is thick, its distal part slender, and it has no dorsal tooth. The median lobe is very curious; its proximal third, to the insertion of the lateral process, is extremely broad, its middle third is considerably narrower, yet broader than long; the distal third originates from the outer distal angle of the preceding part as a kind of thin-skinned, very slender finger with the proximal half directed considerably outwards and the distal part bent conspicuously inwards. The auxiliary lobe of moderate length; the setiferous lobe as in allied species, with seven setae along its triangularly produced terminal margin.

Length of adults of both sexes 11–15 mm., most frequently 12–13.5 mm.

Remarks.— *E. gibba* G. O. S. is closely allied and very similar to *E. pseudogibba* Ortm., *E. hemigibba* H. J. H., and *E. paragibba* H. J. H. These four species are in reality so similar in general aspect, in shape of rostrum, size of eyes, lobe

of first antennular joint, etc., that a close examination is necessary in order to separate them with certainty. As pointed out in the "Siboga" Report, the male copulatory organs of first pleopods afford excellent specific characters, and it may be added that these organs in *E. gibba* differ strongly from those in the three species mentioned by the very short and curiously shaped terminal process, the very long and strong proximal process and the finger-shaped, very slender and feebly chitinized terminal part of the median lobe. The female is very similar to that of *E. paragibba*, the only difference being that the distal part of the keel on the third antennular joint is a little higher and less rounded than in the latter species. Furthermore *E. gibba* is generally smaller than *E. paragibba* and differs in all probability in the living state by the colour of the body; the Agassiz collection contains specimens of both species from a good number of localities, and while the specimens of *E. paragibba* are whitish or a little yellowish, those of *E. gibba* are less or more yellowish or sometimes light brownish or even somewhat saffron coloured.

It is seen from the "Challenger" localities that Sars has confused at least two species, because *E. gibba* does not occur in the Atlantic. He has marked a specimen from the West Pacific, between Api and Cape York, as type, and his fig. 6 on Pl. XVI shows that he has examined and figured a male of the species described here as *E. gibba*.

Distribution.— The list of localities shows that *E. gibba* was taken only in the southern parts of the area investigated, viz. only South of Lat. 16° 32′ S. The Copenhagen Museum possesses two specimens from the South Pacific at Lat. 27° 11′ S., long. 88° 52′ W. ("Galathea" Exp.), and the type of Sars was, as already stated, taken between Api and Cape York. Sars states that he has seen specimens of *E. gibba* taken off Kandavu, Fiji Islands, and during my visit to London in 1907, I separated three of his thirteen specimens as being *E. tenera*, but not having at that time discovered the importance of the copulatory organs, and that therefore new species ought to be separated from the original *E. gibba* material, I cannot state anything concerning the remaining ten specimens.

But all statements in the literature as to the occurrence of *E. gibba* in the Atlantic and the Indian Ocean are to be cancelled, as all the specimens re-examined by me belong to *E. hemigibba* H. J. H., *E. pseudogibba* Ortm., or *E. paragibba* H. J. H.

20. **Euphausia paragibba** H. J. Hansen.

1910. *Euphausia paragibba* H. J. Hansen, Siboga-Exp., **37**, p. 100, pl. 14, figs. 6a–6d.

Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 5 specimens.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 7 specimens.

Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 17 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 32.2′ S., long. 97° 42′ W. 300 fms. to surface. 2 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 5 specimens.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 8 specimens.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 2 specimens.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 1 specimen.

One of the largest specimens, a female, measures 17 mm., a very small adult male is scarcely 12 mm. long, but the most common size is 15–15.5 mm.

Distribution.— This species has been established on a few specimens taken in the Indian Archipelago, at Lat. 0° 17.6′ S., long. 129° 14.5′ E. The Copenhagen Museum possesses males from two localities, viz. Lat. 13° S., long. 103° 20′ E. (Capt. Andréa) and Lat. 34° 30′ S., long. 27° 40′ E. (Capt. Hartmann), the latter being in the most western part of the Indian Ocean, East of Port Elizabeth. The list above shows that the species has been taken ten times in a transverse belt about between the line and Lat. 19° S. in the area explored by Agassiz 1904–1905, while it was not met with in the larger northern and smaller southern part. Furthermore the list seems to show that the species at least as a rule does not live at the surface, but the specimens in the Copenhagen Museum have certainly been taken near the surface and probably during night.

21. **Euphausia pseudogibba** Ortmann.

1893. *Euphausia pseudogibba* Ortmann, Ergebn. der Plankton-Exped., **2**, G., b., p. 12, taf. I, fig. 6.
1910. *Euphausia pseudogibba* H. J. Hansen, Siboga-Exp., **37**, p. 97; pl. 14, figs. 4a–4e.

Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 1 specimen.

I have nothing to add to the description in the "Siboga" paper.

Distribution.— Only the two specimens recorded from the Pacific are known hitherto; Ortmann's specimens from the Hawaiian Islands referred (1905) to *E. pseudogibba* belong to *E. hemigibba* H. J. H. The Copenhagen Museum and the Monaco collection contain numerous specimens from several localities from the eastern warmer temperate and tropical Atlantic North of the line; furthermore I have seen specimens from the Bay of Bengal ("Galathea" Exp.) and from Lat. 11° 16′ S., long. 103° 50′ E. (Capt. Andréa).— The specimens from twelve localities in all in the Copenhagen Museum are nearly all males and have certainly been taken at the surface during the night.

(The fourth species of the *gibba*-group *sens. strict.*, *E. hemigibba* H. J. H. (see the "Siboga" paper) is very common in the Atlantic from Lat. 42° N. to southwest of the Cape of Good Hope, and in the Indian Ocean from Port Eliza-

beth to Long. 103° E. (the Copenhagen Museum possesses specimens from no less than forty-two localities in these Oceans), but it was taken only at a single Station in the Indian Archipelago by the "Siboga", and from the Pacific at the Hawaiian Islands, viz. the above-mentioned specimens referred by Ortmann to *E. pseudogibba*).

22. **Euphausia distinguenda** H. J. Hansen.

Plate 8, figs. 3a–3f.

1911. *Euphausia distinguenda* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 32.

Sta. 4583. Oct. 11, 1904. Lat. 22° 45′ N., long. 110° 5′ W. 300 fms. to surface. 3 specimens.
Sta. 4587. Oct. 12, 1904. Lat. 20° 42′ N., long. 107° 25′ W. 300 fms. to surface. 2 specimens.
Sta. 4588. Oct. 12, 1904. Lat. 19° 52′ N., long. 106° 22′ W. Surface. 12 specimens, all immature, the majority small or very small.
Sta. 4590. Oct. 12, 1904. Lat. 18° 50′ N., long. 104° 50′ W. 300 fms. to surface. 7 specimens.
Sta. 4592. Oct. 13, 1904. Lat. 18° 20′ N., long. 103° 40′ W. Surface. 1 small specimen.
Sta. 4594. Oct. 14, 1904. Lat. 17° 20′ N., long. 101° 32′ W. 300 fms. to surface. 10 specimens.
Sta. 4596. Oct. 14, 1904. Lat. 16° 47′ N., long. 100° 27′ W. Surface. 58 specimens, small.
Sta. 4598. Oct. 15, 1904. Lat. 15° 58′ N., long. 98° 13′ W. 300 fms. to surface. 19 specimens.
Sta. 4605. Oct. 17, 1904. Lat. 12° 21′ N., long. 92° 13′ W. 300 fms. to surface. 15 specimens.
Sta. 4613. Oct. 19, 1904. Lat. 9° 45′ N., long. 86° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4615. Oct. 19, 1904. Lat. 9° 7′ N., long. 85° 11′ W. Surface. 6 small specimens.
Sta. 4619. Oct. 20, 1904. Lat. 7° 15′ N., long. 82° 8′ W. Surface. 10 small specimens.
Sta. 4634. Nov. 4, 1904. Lat. 4° 35.4′ N., long. 83° 32.3′ W. 300 fms. to surface. 4 specimens.
Sta. 4637. Nov. 5, 1904. Lat. 1° 31′ N., long. 86° 32′ W. 300 fms. to surface. 20 specimens.
Sta. 4640. Nov. 6, 1904. Lat. 0° 39.4′ S., long. 88° 11′ W. Surface. 1 small specimen.
Sta. 4644. Nov. 7, 1904. Lat. 2° 13.3′ S., long. 89° 42.2′ W. Surface. 2 small specimens.
Sta. 4646. Nov. 8, 1904. Lat. 4° 1.6′ S., long. 89° 16.3′ W. 300 fms. to surface. 11 specimens.
Sta. 4649. Nov. 10, 1904. Lat. 5° 17′ S., long. 85° 19.5′ W. 300 fms. to surface. 9 specimens.
Sta. 4650. Nov. 10, 1904. Lat. 5° 22′ S., long. 84° 39′ W. 300 fms. to surface. 35 specimens.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. { 100 fms. to surface. 11 specimens. / 200 fms. to surface. 5 specimens. / 400 fms. to surface. 5 specimens.
Sta. 4657. Nov. 13, 1904. Lat. 7° 12.5′ S., long. 84° 9′ W. 300 fms. to surface. 1 specimen.
Sta. 4659. Nov. 14, 1904. Lat. 8° 54.5′ S., long. 86° 5.5′ W. 300 fms. to surface. 11 specimens.
Sta. 4661. Nov. 15, 1904. Lat. 10° 17′ S., long. 88° 2′ W. 300 fms. to surface. 1 specimen.
Sta. 4663. Nov. 16, 1904. Lat. 11° 20.3′ S., long. 88° 55.2′ W. 300 fms. to surface. 18 specimens.
Sta. 4665. Nov. 17, 1904. Lat. 11° 45′ S., long. 86° 5.2′ W. { Surface. 1 small specimen. / 300 fms. to surface. 24 specimens.
Sta. 4667. Nov. 18, 1904. Lat. 11° 59.5′ S., long. 83° 40.4′ W. { Surface. 1 specimen, scarcely adult. / 300 fms. to surface. 13 specimens.
Sta. 4668. Nov. 19, 1904. Lat. 12° 9.3′ S., long. 81° 45.2′ W. Bottom of Tanner net, 300 fms. 3 specimens.
Sta. 4669. Nov. 19, 1904. Lat. 12° 12.7′ S., long. 80° 25.6′ W. 300 fms. to surface. 6 specimens.
Sta. 4671. Nov. 20, 1904. Lat. 12° 6.9′ S., long. 78° 28.2′ W. 300 fms. to surface. 5 specimens.
Sta. 4673. Nov. 21, 1904. Lat. 12° 30.5′ S., long. 77° 49.4′ W. 300 fms. to surface. 2 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 2 specimens.
Sta. 4710. Dec. 30, 1904. Lat. 9° 30.5′ S., long. 95° 8.3′ W. Surface. 1 adult specimen.
Sta. 4713. Jan. 1, 1905. Lat. 5° 35.2′ S., long. 92° 21.6′ W. 300 fms. to surface. 3 specimens.
Sta. 4715. Jan. 2, 1905. Lat. 2° 40.4′ S., long. 90° 19.3′ W. 300 fms. to surface. 3 specimens.
Sta. 4717. Jan. 2, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 3 specimens.

Description.— Body slender.— Frontal plate (fig. 3a) moderately short, with a portion of each lateral margin somewhat convex, anteriorly produced

in a small or nearly rudimentary, acute rostrum which is badly defined, broader or much broader than long, about half as long as the breadth of second antennular joint or even conspicuously smaller. The gastric area well developed, with the median keel, seen from the side (fig. 3b), rather high and even slightly angular.

Eyes rather small; eye-stalks a little longer in proportion to their distal breadth than in allied species and in very young specimens somewhat conspicuously long.— The antennular peduncles moderately strong; the proximal joint distally somewhat raised (fig. 3c) above the base of second joint, but the lobe may be termed rudimentary, as the terminal margin, seen from above (fig. 3d), is somewhat convex and with a small incision rather near the middle. Second joint at the upper outer distal angle with a rather short and high, oblique keel (figs. 3c and 3d, p.) directed upwards and somewhat forwards, forming almost an ear-like, rounded process; the distal upper margin of the joint from this process to the inner margin is somewhat oblique (fig. 3d). Third peduncular joint, seen from the outer side (fig. 3c), with its distal half occupied above by a high keel, highest at the middle and, if well preserved, with the distal upper angle rectangular and acute, the terminal margin a little concave and oblique.— The antennal squama is somewhat broad, less than three times as long as broad, tapering considerably towards the end so that the terminal transverse margin is short and there is no tooth from the outer angle; the spine-shaped process from the outer angle of the peduncle nearly one third as long as the squama.

First and second abdominal segments slightly produced above at the middle of the posterior margin, but this produced part is rounded, scarcely angular. Third segment posteriorly produced in a spiniform, compressed process, from one third to nearly half as long as the following segment. Fourth and fifth segments without any trace of a dorsal tooth. Sixth segment long, twice as long as deep. Preanal spine simple in both sexes.— Endopod of the uropods slightly longer than the exopod and as long as, or even a little longer than, the telson.

The copulatory organs (figs. 3e–3f) show some peculiar features. The terminal process has a rather long foot and a very long, curved heel; the portion beyond the foot is moderately short, thick at the base, tapering considerably to beyond the middle where it is curved somewhat inwards, while its distal part is slender with the end scarcely acute. The proximal process (fig. 3f, p^3.) has somewhat less than the proximal half stout and almost straight, then it bends abruptly considerably inwards and becomes rapidly thinner, being at the middle much narrower or even only half as broad as its proximal part; a little beyond the middle the inner side is almost abruptly considerably expanded, and this

expansion decreases gradually to somewhat before the end; the terminal part is curved inwards and tapers to the acute end. The median lobe is normal, terminating in a somewhat flattened, rounded lobe; the lateral process (fig. 3e) is rather robust at the base; considerably beyond the middle it is bent very strongly, both inwards and considerably in the proximal direction, and at the bending it has a very conspicuous, curved, acute dorsal (or outer) tooth and sometimes still a smaller tooth or two small teeth (fig. 3f, p^4.). The auxiliary lobe is long. The setiferous lobe is broad, with five setae from the triangularly produced terminal part and about four setae distributed along the outer margin.

Length of both sexes 10–14.5 mm.

Type.— A male from Sta. 4665; 300 fms. to surface.

Remarks.— *E. distinguenda* resembles *E. paragibba* and allied species by its slender body and rather small eyes, but it is easily distinguished by having no protruding, acute lobe from first antennular joint, by the somewhat ear-like keel at the outer angle of the second joint, and by the copulatory organs; the reduced rostrum, the high keel on the third antennular joint, and the dorsal process on third abdominal segment being compressed afford other valid but less conspicuous characters.

Distribution.— The long list of localities shows that this species is common in a large part of the area explored, viz. from Lat. $22\frac{2}{3}°$ N. to Lat. $12\frac{1}{2}°$ S., while it is wanting south of the last-named latitude, and besides it was not taken in the southwestern part of the area, west of Long. 100° and south of the line. Many of the specimens referred by Ortmann (1894) to *E. mucronata* G. O. S. belong to *E. distinguenda*. But I have not seen a specimen of this species from any other area or ocean. The list shows that the species was several times taken at the surface, but that the specimens in question were nearly all immature and generally small.

23. **Euphausia lamelligera** H. J. Hansen.

Plate 8, figs. 4a–4c; Plate 9, fig. 1a.

1911. *Euphausia lamelligera* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 32.

Sta. 4588. Oct. 12, 1904. Lat. 19° 52′ N., long. 106° 22′ W. Surface. 1 young specimen.
Sta. 4592. Oct. 13, 1904. Lat. 18° 20′ N., long. 103° 40′ W. Surface. 2 specimens.
Sta. 4605. Oct. 17, 1904. Lat. 12° 21′ N., long. 92° 13′ W. 300 fms. to surface. 4 specimens.
Sta. 4611. Oct. 18, 1904. Lat. 10° 33′ N., long. 88° 30′ W. Surface. 27 specimens.
Sta. 4613. Oct. 19, 1904. Lat. 9° 45′ N., long. 86° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4615. Oct. 19, 1904. Lat. 9° 7′ N., long. 85° 11′ W. Surface. 20 specimens.
Sta. 4619. Oct. 20, 1904. Lat. 7° 15′ N., long. 82° 8′ W. Surface. 30 specimens.
Sta. 4640. Nov. 6, 1904. Lat. 0° 39.4′ S., long. 88° 11′ W. Surface. 1 specimen.
Sta. 4648. Nov. 9, 1904. Lat. 4° 43′ S., long. 87° 7.5′ W. Surface. 1 specimen.

Sta. 4650. Nov. 10, 1904. Lat. 5° 22′ S., long. 84° 39′ W. { Surface. 1 specimen. / 300 fms. to surface. 3 specimens.

Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. { Surface. 2 specimens. / 100 fms. to surface. 31 specimens. / 200 fms. to surface. 23 specimens. / 400 fms. to surface. 15 specimens.

Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. { Surface. 2 specimens. / 400 fms. to surface. 4 specimens.

Sta. 4657. Nov. 12, 1904. Lat. 7° 12.5′ S., long. 84° 9′ W. { Surface. 22 specimens. / 300 fms. to surface. 1 specimen.

Sta. 4659. Nov. 14, 1904. Lat. 8° 54.5′ S., long. 86° 5.5′ W. 300 fms. to surface. 4 specimens.

Sta. 4661. Nov. 15, 1904. Lat. 10° 17′ S., long. 88° 2′ W. Surface. 1 specimen.

Description.— Body slender.— The frontal plate (fig. 4a) is very short, but laterally somewhat produced with right angles, while the long front margin is almost transverse, being only feebly produced at the middle with an extremely obtuse angle, and consequently no rostrum is developed. The gastric area is highly vaulted and, seen from the side, with the upper margin angular (fig. 4b), but a real keel is not developed.

The eyes are large.— The antennular peduncles are somewhat robust; the basal joint is much raised above towards the terminal margin (fig. 4c), which is situated much above the base of second joint and produced in a moderately small lobe projecting upwards, forwards, and outwards (fig. 4d); the end of the lobe is more or less distinctly cleft. Second joint at the end furnished with a very large, movable lamella which, seen from above (fig. 4d, l.), is subtriangular, reaching almost to the inner margin, and covering the outer proximal half or still more of the upper surface of the third joint; while seen from the side (fig. 4c) its lower margin runs almost along the middle of the side of the third joint, so that the proximal upper fourth or still more of the whole outer surface of the joint is covered; in immature specimens this lamella is smaller and in about half-grown individuals quite small. The third joint, seen from the outer side (fig. 4c) with the dorsal keel high, occupying the distal half of the joint, with the front margin long and a little oblique, the angle between this margin and the upper margin being about 100°.— The antennae nearly as in *E. distinguenda*.

Third abdominal segment with a dorsal, slender, spiniform, compressed process a little or scarcely more than one third as long as the next segment; fourth and fifth segments without any vestige of dorsal denticles. Sixth segment long, even a little more than twice as long as deep.— Exopod of uropods a little longer than the endopod and conspicuously shorter than the telson.

The copulatory organs (Plate 8, fig. 4e; Plate 9, fig. 1a) show some similarity to those of *E. distinguenda*, but there are several differences. The terminal process has a rather long foot, but its heel is somewhat short and curved,

and the process beyond the foot is rather long, regularly tapering in breadth from the robust base to the acute end; also a little curved and towards the acute end curved considerably inwards. The proximal process has the proximal three fifths robust and somewhat curved, with the inner margin concave and the outer more convex, as the part at the middle is thicker than at each end; the distal two fifths are flattened, towards the end quite flat, with the proximal half of its antero-interior margin somewhat convex, as this part, seen from behind (fig. 1a), is considerably expanded; then it tapers in breadth towards the rounded end and the most distal part is so flattened that, seen from the inner side (fig. 4e), it looks quite thin with the end nearly acute. The median lobe has its terminal part produced as a narrow but moderately short lobe which is rounded at the end and directed obliquely forwards, it is therefore seen better from the inner side (fig. 4e); the lateral process is of moderate size, curved inwards more or less beyond the middle and with a sharp dorsal tooth slightly beyond the curvature. The auxiliary lobe is long. The setiferous lobe is broad, with six setae from the triangularly produced terminal part, but with no setae along the outer margin.

Length of adult males 7.5–10 mm., of a large female 10.8 mm.

Type.— A male from Sta. 4652; 100 fms. to surface.

Remarks.— This small species is easily distinguished from all other forms by the large, movable lamella projecting from the second antennular joint and covering a large portion of the upper and outer portion of third joint. The shape of the short frontal plate, of the lobe from the first antennular joint, etc., afford other valuable characters.

Distribution.— The list of localities shows that *E. lamelligera* is common in the eastern part of the area explored in 1904–1905, but only between Lat. 20° N. and Lat. $10\frac{1}{3}$° S., furthermore it was frequently taken at the surface and at times in considerable numbers. The species is unknown to me from any other area or ocean.

24. **Euphausia gibboides** Ortmann.

Plate 9, figs. 2a–2h.

1893. *Euphausia gibboides* Ortmann, Ergebn. der Plankton-Exped., **2**, G., b., p. 12, taf. 1, fig. 5.
1911. *Euphausia gibboides* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 33.

Sta. 4634. Nov. 4, 1904. Lat. 4° 35.4′ N., long. 83° 32.3′ W. 300 fms. to surface. 2 specimens.
Sta. 4637. Nov. 5, 1904. Lat. 1° 31′ N., long. 86° 32′ W. 300 fms. to surface. 20 specimens.
Sta. 4638. Nov. 6, 1904. Lat. 0° 27′ N., long. 87° 13′ W. 300 fms. to surface. 2 specimens.
Sta. 4715. Jan. 2, 1905. Lat. 2° 40.4′ S., long. 90° 19.3′ W. 300 fms. to surface. 1 specimen.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. 600 fms. to surface. 2 specimens.
Sta. 4717. Jan. 13, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 1 specimen.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 5 specimens.

Furthermore the species was taken twice in 1897 by Dr. Agassiz, viz.:—

Fiji Islands. Dec. 11, 1897. 6 m. South of Suva lightship. 150 fms. 4 specimens.
Fiji Islands. Dec. 11, 1897. 3 m. South of Suva lightship. 100 fms. 1 specimen.

Description.— Body rather stout.— Frontal plate (fig. 2a) is very short, subangular at each side; anteriorly it is produced into a rather long rostrum, the basal part of which is a comparatively somewhat large triangle a little broader than long, while its distal portion is spiniform. The gastric area is, seen from the side (fig. 2b), highly vaulted; the keel from the middle of the rostrum and along that area is sharp.

The eyes are large.— The antennular peduncles moderately robust; the first joint is raised considerably above towards the upper terminal margin (fig. 2c), the major part of which is nearly transverse (fig. 2d), but the inner part is produced into a moderately long lobe projecting forwards and somewhat upwards, tapering in breadth to beyond the middle where it abruptly bends much outwards, this terminal part forming an oblong, acute triangle directed more outwards than forwards. Second joint, seen from above (fig. 2d), is as usually with the inner margin somewhat longer anteriorly than the outer, but the terminal upper margin is not oblique, but transverse, even a little and sometimes considerably concave, extending to about the outer margin of third joint, where it suddenly bends in the proximal direction parallel with the last-named margin; in this way a kind of short, broad lobe is circumscribed, which covers the proximal part of the upper surface of the third joint with the exception of its outermost portion; and the outer part of this lobe is produced slightly or conspicuously forwards, when the transverse terminal margin is considerably concave. The third joint, beginning only a little from the lobe of second joint, has the dorsal keel high; it rises in height to somewhat beyond the middle and is there produced into a slender, porrected tooth; the front margin of the keel is very oblique and deeply incised just below the upper end, the incision limiting the tooth mentioned.— The antennal squama is moderately broad, at most reaching the middle of third antennular joint and without any marginal tooth at the somewhat broad end; the spiniform process from the outer side of the peduncle is long, about half as long as the squama.

First and second abdominal segments at the middle of the dorsal posterior margin are produced a little, but the protuberance is feebly rounded, not angular. Third segment with a short dorsal process which at the base is a carinated plate and distally slender and almost compressed, acute. Fourth and fifth segments without vestige of any dorsal tooth. Sixth segment moderately long, with the

proximal part somewhat deep; preanal spine simple in both sexes.— Exopod of the uropods as long as the telson and as long as or a little shorter than the endopod.

The copulatory organs (figs. 2e–2h) differ in some features from those of above-described forms. The terminal process (p^2.) has the foot of moderate length, the heel rather short, thick, and straight; and the process beyond the foot is moderately long, rather slender and tapering to the acute end; seen from behind straight (fig. 2e), seen from the inner side somewhat curved (fig. 2g). The proximal process (p^3.) is, seen from behind (figs. 2e and 2f), long and nearly regularly curved, constituting about one fourth of a circle; its basal part is very moderately robust, somewhat convex on the outer side; it then tapers gradually to a little before the end, where on the inner — the proximal — margin it has a kind of oblong expansion with a slender tooth from the proximal angle (fig. 2f); seen from the inner side (fig. 2h) this terminal part shows itself as an oblong, rather broad, distally broadly rounded plate placed obliquely on the end of the slender part of the process and possessing the long, slender tooth at its base; a comparison of fig. 2f with fig. 2h, the latter figure showing the plate a good deal shorter than it is in reality because its position is very oblique in proportion to the direction of the view, will show further details not mentioned in the text as to curvature, etc. The median lobe is produced in some degree from the base on the inner side into a somewhat small, oblique, conical tubercle, (a in fig. 2e and fig. 2g); the most distal part of the lobe is widened a little at the curvature of the lateral process and then it tapers to the acute tip (fig. 2g); the lateral process is of moderate size, thick at the base, much bent inwards considerably beyond the middle and without any tooth at the curvature; a minute tooth inserted on the inner side of the lobe, off the curvature of the lateral process, may be interpreted as a rudiment of an additional process. The auxiliary lobe is thicker and a little shorter than in the two preceding species. The setiferous lobe is moderately broad with a couple of setae on the distal part of the inner margin; there are six setae on the triangularly produced terminal part and about three setae (fig. 2g, but not visible in fig. 2e) on the proximal half of the outer side near the outer margin.

Length of an adult male 22 mm., of a very large female 27 mm.

Remarks.— This large species is easily distinguished by the rather long rostrum together with the shape of the lobes from first and second antennular joints. The copulatory organs exhibit features useful as specific characters.

Distribution.— *E. gibboides* Ortm. was established on numerous specimens

collected by the German Plankton-Expedition in various areas of the warmer temperate and the tropical Atlantic, viz:—Sargasso Sea, Northern equatorial current, Guinea current, and Southern equatorial current. The Prince of Monaco secured it at various places in the Eastern Atlantic between Lat. 32½° N. and Lat. 27⅔° N. It is not known from the Indian Ocean, but the Copenhagen Museum possesses a specimen from the Southern Chinese Sea at Lat. 9° 40′ N., long. 109° 20′ E. According to the list of localities from the East Pacific the species was taken only at a small number of Stations all situated in the transverse area between Lat. 4° 35′ N. and Lat. 5° 10′ S. Ortmann enumerated three Stations from the Eastern Pacific, two of which are near the line and not far from the Galapagos, while the third is widely distant, viz. Lat. 35° 19.5′ N., long. 125° 21.5′ W.— The species has very rarely been taken at the surface.

25. **Euphausia mucronata** G. O. Sars.

Plate 9, figs. 3a–3g.

1883. *Euphausia mucronata* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 16.
1885. *Euphausia mucronata* G. O. Sars, Challenger Rept., **13**, p. 87, pl. 15, figs. 9–11.
1911. *Euphausia mucronata* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 33. (With one text-figure).

Sta. 4652. Nov. 11, 1904. Lat. 5° 47.7′ S., long. 82° 39.5′ W. 100 fms. to surface. 1 specimen.
Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. { Surface. 2 specimens. / 400 fms. to surface. 22 specimens.
Sta. 4657. Nov. 13, 1904. Lat. 7° 12.5′ S., long. 84° 9′ W. 300 fms. to surface. 8 specimens.
Sta. 4667. Nov. 18, 1904. Lat. 11° 59.5′ S., long. 83° 40.4′ W. 300 fms. to surface. 2 specimens.
Sta. 4668. Nov. 19, 1904. Lat. 12° 9.3′ S., long. 81° 45.2′ W. Open part of Tanner net, 300 fms. to surface. 3 specimens.
Sta. 4669. Nov. 19, 1904. Lat. 12° 12.7′ S., long. 80° 25.6′ W. 300 fms. to surface. 8 specimens.
Sta. 4671. Nov. 20, 1904. Lat. 12° 6.9′ S., long. 78° 28.2′ W. 300 fms. to surface. 31 specimens.
Sta. 4673. Nov. 21, 1904. Lat. 12° 30.5′ S., long. 77° 49.4′ W. { Surface. 13 specimens. / 300 fms. to surface. 30 specimens.
Sta. 4676. Dec. 5, 1904. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 69 specimens.
Sta. 4677. Dec. 5, 1904. Lat. 14° 37.5′ S., long. 81° 41′ W. Surface. 4 specimens.

Description.— Body moderately slender.— Frontal plate (fig. 3a) very short, somewhat protruding but not angular at the sides, produced into a badly defined, short rostrum about three times as broad as long with the end acute or subacute. The gastric area, seen from the side (fig. 3b), highly vaulted with the upper margin angular or subangular; the median keel along this area is sharp but terminates anteriorly nearly at the base of the rostrum (fig. 3a).

The eyes are extremely large.— The antennular peduncles are moderately robust; first joint, seen from the side (fig. 3c) elevated towards the end, where it is produced in a rather short, deeply bifid lobe (fig. 3d) with its two oblong, acute teeth directed somewhat upwards and more outwards than forwards, the

lobe therefore overlapping a very small portion of the next joint; the inner tooth of the lobe is generally longer and stouter than the outer. Second joint conspicuously longer than third, with its dorsal wall produced feebly in front above the base of third joint and the upper terminal margin near the outer side produced in a low, acute angle (fig. 3d); third joint, seen from the side (fig. 3c), with the dorsal keel occupying somewhat more than half of the upper margin, moderately high and increasing in height to the end which in well-preserved specimens is produced in an acute denticle, while the front margin is steep, not quite vertical.— The antennal squama somewhat broad, with the terminal margin of middle length, transverse, without tooth at the outer margin. The spiniform process from the outer side of the peduncle short, less than one fourth or one fifth as long as the squama.

First and second abdominal segments at the middle of the upper posterior margin a little produced, but the protuberance is broadly rounded. Third segment a little expanded backwards at the middle of the hind margin and produced in a somewhat short, strong, conspicuously compressed, acute process, which has the upper margin a little curved, the lower straight, and the process is continued a little forwards as a keel. Fourth and fifth segments with the hind margin distinctly produced in the median line, forming either a sharp angle or a very short denticle. Sixth segment moderately long, somewhat less than twice as long as deep. Preanal spine wanting in both sexes.— Uropods with the rami subequal in length and as long as, or a little shorter than, the telson.

The copulatory organs (figs. 3e–3g) differ in several features from those in allied forms. The terminal process (p^2.) with the foot moderately long, the heel rather short but considerably curved, the part beyond the foot moderately long, somewhat slender, proximally straight, distally curved considerably inwards and forwards and with the terminal part a little expanded and flattened, very oblong-oval with the end blunt. The proximal process (p^3.) is of very moderate length; almost all the proximal half is rather stout and a little bent before its middle; the distal half is bent strongly inwards and tapers considerably to not far from the end, while the terminal portion is abruptly very much expanded, seen from the inner side (fig. 3g) forming a broad plate bent strongly backwards (in the figure therefore to the right), and with a sharp, protruding angle on its proximal part; seen from behind (fig. 3f) this terminal plate is oblong, somewhat expanded upwards, and this expanded part seemingly proximally produced into a long tooth crossing the posterior surface of the process and projecting

on its proximal or inner side; that this terminal part is so extremely different in outline when seen from the inner side and from behind is due to its very curious shape and the irregular curvature of the plate itself. The distal part of the median lobe is produced in a rather long, tapering, terminally rounded lobe projecting very much beyond the distal part of the lateral process; this process (p^4.) is somewhat small, beyond the middle strongly curved inwards and without any tooth at the bend; the additional process (p^5.) is shaped as a rather small but strong spine inserted a little beyond the curvature of the lateral process. The auxiliary lobe is long and slender. The setiferous lobe is broad, with setae along the distal part of the inner margin, along both margins of the triangularly produced terminal part and along almost the proximal two thirds of the outer margin, leaving the distal shorter part naked.

Length of males 18.5–19.5 mm., of one of the largest females 22 mm.

Remarks.— According to my examination of Sars's type in the British Museum his figures and description are incorrect in several particulars. It may be pointed out that the type has the lobe of first antennular joint with two teeth, the process on the third abdominal segment cannot be described as "mucronate", because its lower margin is straight but the upper margin convex, and the eye is too small in the figure. These specimens were certainly not full grown. The species is easily distinguished by having distinctly produced, acute angles or real, small denticles on the upper posterior margin of fourth and fifth abdominal segments, furthermore by its extremely large eyes, the bifid and very oblique lobe from first antennular joint but with no ear-like process or lamella on second joint, etc.

Distribution.— The ten Stations above named are all situated in a rather small area along the coast of Peru; the Station most remote from that coast is at a distance from it of about 120 geographical miles. Sars's specimens were taken off the coast of Chile. This species is unknown from any other area in the Pacific, as the specimens referred to it by Ortmann belong to the two preceding species. And it was never found in the Indian Ocean or the Atlantic.

PSEUDEUPHAUSIA H. J. Hansen (1910).

Only a single species is known.

26. **Pseudeuphausia latifrons** G. O. Sars.

1883. *Euphausia latifrons* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 19.
1885. *Euphausia latifrons* G. O. Sars, Challenger Rept., **13**, p. 95, pl. 16, figs. 17–23.
1910. *Pseudeuphausia latifrons* H. J. Hansen, Siboga-Exp., **37**, p. 103, pl. 15, figs. 1a–1d.

Not a specimen of this species was found among the material secured in 1904–1905, but Dr. Agassiz has taken a number of specimens at several localities in the Fiji Islands in 1897.

Fiji Islands. Off Vatu. Dec. 9, 1897. 30 fms. 12 specimens.
Fiji Islands. 3 m. South of Nanuka. Dec. 10, 1897. 50 fms. 1 specimen.
Fiji Islands. 6 m. South of Suva lightship. Dec. 10, 1897. 100 fms. 1 specimen.
Fiji Islands. 5 m. South of Suva lightship. Dec. 10, 1897. 100 fms. 4 specimens.
Fiji Islands. 3 m. South of Suva lightship. Dec. 11, 1897. 100 fms. 2 specimens, both adult males.
Fiji Islands. 5 m. South of Suva lightship. Dec. 16, 1897. 100 fms. 1 specimen.
Fiji Islands. Eastern entrance of the Nibengha passage. Dec. 16, 1897. Surface. 14 specimens.
Fiji Islands. Eastern entrance of the Nibengha passage. Dec. 16, 1897. 100 fms. 2 specimens.

Remarks.— All the specimens, excepting two, are immature and many among them less than half grown or merely larval stages. In the following chapter on the larval stages such larvae are mentioned, especially with reference to their differences from the larvae of *Nyctiphanes simplex* H. J. H.

Distribution.— Sars's specimens were from the Southeastern coast of Australia, from the Arafura Sea and off Mindanao, Philippine Islands. The "Siboga" captured enormous multitudes at a large number of Stations in the Indian Archipelago. The Copenhagen Museum possesses some specimens taken at Lat. 24° 17′ N., long. 118° 15′ E., between Formosa and China (Capt. Suenson) and many specimens from the Bay of Bengal ("Galathea" Exp.). Stebbing mentioned it "as observed in great numbers N. 10° W. of Cape St. Blaize, 33 miles (South coast of Africa).

This peculiar form seems always to live not very far from land, and it has most frequently been taken near the surface.

NEMATOSCELIS G. O. Sars (1883).

The account of this genus given by Sars in the "Challenger" Report is somewhat deficient, because his material was very poor; he had in reality no males and of only one species a sufficient numbers of females. In recent papers I have pointed out interesting sexual differences and various characters in maxillulae, thoracic legs, and copulatory organs. And it may be useful to reprint here the addition to the generic description, etc. given in 1911.

In the female second and third peduncular joints of the antennulae are slender and rather long; in adult males these joints are conspicuously thicker, second joint somewhat and the third considerably shorter than in the other sex; peculiar lobes or processes on these joints are always wanting. Sixth pair of legs with the exopod well developed in both sexes, the endopod two-jointed and longer than the exopod in the female, wanting in the male. The

copulatory organs possess the three processes on the inner lobe, but the spine-shaped process is nearly straight and nearly parallel with the two others which are inserted on the end of the lobe; the lateral process is never hook-shaped and an additional process is wanting.— The females carry their eggs.

It may be added that in the majority of the species the rostrum is rather long or extremely so in the female, much smaller or quite rudimentary in the adult male.

Six species are known. They may be divided into two groups separated by some sharp and interesting characters.

A. *Maxillulae with a pseudexopod well developed. First elongate pair of thoracic legs with long spines both from the terminal joint and from the distal end of the penultimate joint. Endopod of second to fifth pairs of thoracic legs with the full number, viz. three, joints beyond the knee.*

B. *Maxillulae without pseudexopod. First elongate pair of thoracic legs with long spines only from the terminal joint. Endopod of second and third pairs of thoracic legs with but two joints beyond the knee; endopod of fourth and fifth pairs with only one joint beyond the knee.*

Group A comprises two species, but they are not represented in the material received from Dr. Agassiz. Group B comprises four species which can be separated by the key in the "Siboga" paper, p. 107; three of these species are dealt with below.

27. **Nematoscelis microps** G. O. Sars.

Plate 9, figs. 4a–4d; Plate 10, figs. 1a–1b.

1883. *Nematoscelis microps*. G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 28.
1885. *Nematoscelis microps* G. O. Sars, Challenger Rept., **13**, p. 131, pl. 25, figs. 1–4.
1910. *Nematoscelis microps* H. J. Hansen, Siboga-Exp., **37**, p. 107, pl. 15, figs. 2a–2k. (With full synonymy).

Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 6 specimens.
Sta. 4683. Dec. 9, 1904. Lat. 20° 2.4′ S., long. 91° 52.5′ W. 300 fms. to surface. 3 specimens.
Sta. 4685. Dec. 10, 1904. Lat. 21° 36.2′ S., long. 94° 56′ W. 300 fms. to surface. 11 specimens.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. { 300 fms. to surface. 3 specimens. / 2125 fms. to surface. 1 specimen.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4691. Dec. 13, 1904. Lat. 25° 27.3′ S., long. 103° 29.3′ W. 300 fms. to surface. 5 specimens.
Sta. 4695. Dec. 23, 1904. Lat. 25° 22.4′ S., long. 107° 45′ W. 300 fms. to surface. 2 specimens.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 4 specimens.
Sta. 4703. Dec. 27, 1904. Lat. 17° 18.6′ S., long. 100° 52.3′ W. 300 fms. to surface. 1 specimen.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 12 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 33.2′ S., long. 97° 42′ W. 300 fms. to surface. 2 specimens.
Sta. 4729. Jan. 19, 1905. Lat. 14° 15′ S., long. 115° 13′ W. Surface. 1 specimen.

Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 14 specimens.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 9 specimens.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 2 specimens.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 2 specimens.

Finally from the following locality:—

Fiji Islands. 5 m. South of Suva lightship. Dec. 16, 1897. 100 fms. 1 small specimen. A. Agassiz.

To the description and remarks in the "Siboga" paper a few points may be added.

The maxillae (fig. 1a) have the main part, viz. second and third joints with their lobes, very large in proportion to the fourth joint; the palp, which is much smaller than in the two following species, scarcely half as long again as broad and only a little more than half as long as the inner margin of the lobe of third joint.

In most adult females the rostrum is long (fig. 4c) and only moderately broad towards the base, but in two or three females the rostrum is very short and broadly rounded (fig. 4d); whether this aberrant feature is an individual anomaly or is due to damage days or weeks before the capture of the individuals cannot be decided. .The adult males from the East Pacific differ from those from other oceans by having the very slender rostrum (fig. 4a) appreciably longer, about as long as or a little longer than the breadth of the second antennular joint. Finally immature males before the last moult may be mentioned. As is seen from a comparison of fig. 4a, representing an adult male, with fig. 4b representing an immature male — and both figures were drawn with the same degree of enlargement — the two distal joints of the antennular peduncles are proportionately more slender and especially the third joint conspicuously longer in the immature than in the adult, furthermore the former has the rostrum somewhat longer and broader at the base than is the case in the adult.— Finally the copulatory organs, as the difference in the relative length of the processes in the adult and in the immature male is interesting and at first sight even bewildering.

In the adult *N. microps* the proximal process is, as shown in the "Siboga" paper, considerably or much longer than the terminal process, while in the immatures males the difference between the length of the two processes mentioned is slight (Plate 10, fig. 1b), thus in this respect only it is but slightly different from the feature found in *N. atlantica* H. J. H. (In the latter species, however, the terminal process overreaches considerably the spine-shaped process, which is not the case in the immature *N. microps*). And it is very interesting

that the processes are so highly developed in males before their last moult; that such specimens are immature can easily be seen by comparing the distal joints of their antennular peduncles with those in adult specimens.

One of the largest females is 21 mm. long, an adult male 16 mm. and an immature male 13 mm.; fig. 4c, fig. 4a, fig. 4b exhibit the front part of these specimens.

Distribution.— The list above shows that all localities excepting one are situated in a transverse southern belt of the area explored, between about Lat. 12° 33′ S. and Lat. 25° 27′ S., and that the belt is rather far from reaching the West coast of South America; a single locality (Sta. 4742) is situated near the line.— In the "Siboga" paper a good number of Stations in the Indian Archipelago were enumerated, and besides it was stated that I have this species in the Monaco material from the warmer temperate northeastern Atlantic. Sars's type is from the "Pacific, North of the Sandwich Islands." But all the localities enumerated in the literature before the "Siboga" paper must be considered valueless, because *N. microps* has been confounded with *N. atlantica* H. J. H., *N. gracilis* H. J. H.— both species established in 1910 — and partly even with *N. tenella* G. O. S. I have seen Ortmann's specimens from the first six of the eight localities enumerated for *N. microps* in 1894, and all belong to the two following species. *N. microps* is very rarely taken at the surface.

28. **Nematoscelis gracilis** H. J. Hansen.

Plate 10, fig. 2a.

1910. *Nematoscelis gracilis* H. J. Hansen, Siboga-Exp., **37**, p. 109, pl. 15, figs. 3a–3g.

Sta. 4598.	Oct. 15, 1904.	Lat. 15° 58′ N., long. 98° 13′ W.	300 fms. to surface. 3 specimens.
Sta. 4605.	Oct. 17, 1904.	Lat. 12° 21′ N., long. 92° 13′ W.	300 fms. to surface. 1 small specimen.
Sta. 4611.	Oct. 18, 1904.	Lat. 10° 33′ N., long. 88° 30′ W.	Surface. 53 small specimens.
Sta. 4613.	Oct. 19, 1904.	Lat. 9° 45′ N., long. 86° 20′ W.	300 fms. to surface. 10 small specimens.
Sta. 4634.	Nov. 4, 1904.	Lat. 4° 35.4′ N., long. 83° 32.3′ W.	300 fms. to surface. 10 specimens.
Sta. 4637.	Nov. 5, 1904.	Lat. 1° 31′ N., long. 86° 32′ W.	300 fms. to surface. 10 specimens.
Sta. 4646.	Nov. 8, 1904.	Lat. 4° 1.6′ S., long. 89° 16.3′ W.	300 fms. to surface. 7 specimens.
Sta. 4649.	Nov. 9, 1904.	Lat. 5° 17′ S., long. 85° 19.5′ W.	300 fms. to surface. 9 specimens.
Sta. 4650.	Nov. 10, 1904.	Lat. 5° 22′ S., long. 84° 39′ W.	300 fms. to surface. 6 specimens.
Sta. 4652.	Nov. 11, 1904.	Lat. 5° 44.7′ S., long. 82° 39.5′ W.	100 fms. to surface. 9 specimens. 200 fms. to surface. 2 specimens. 400 fms. to surface. 6 specimens.
Sta. 4655.	Nov. 12, 1904.	Lat. 5° 57.5′ S., long. 80° 50′ W.	400 fms. to surface. 1 specimen.
Sta. 4657.	Nov. 13, 1904.	Lat. 7° 12.5′ S., long. 84° 9′ W.	300 fms. to surface. 2 specimens.
Sta. 4659.	Nov. 14, 1904.	Lat. 8° 54.5′ S., long. 86° 5.5′ W.	300 fms. to surface. 14 specimens.
Sta. 4661.	Nov. 15, 1904.	Lat. 10° 17′ S., long. 88° 2′ W.	300 fms. to surface. 1 specimen.
Sta. 4663.	Nov. 16, 1904.	Lat. 11° 20.3′ S., long. 88° 55.2′ W.	300 fms. to surface. 5 specimens.
Sta. 4664.	Nov. 17, 1904.	Lat. 11° 30.3′ S., long. 87° 19′ W.	300 fms. to surface. 4 specimens.
Sta. 4665.	Nov. 17, 1904.	Lat. 11° 45′ S., long. 86° 5.2′ W.	300 fms. to surface. 19 specimens.
Sta. 4667.	Nov. 18, 1904.	Lat. 11° 59.5′ S., long. 83° 40.4′ W.	300 fms. to surface. 3 specimens.

Sta. 4668.	Nov. 19, 1904.	Lat. 12° 9.3′ S., long. 81° 45.2′ W.	Top of Tanner net, 300 fms. to surface. 1 specimen. Bottom of Tanner net, 300 fms. 10 specimens.
Sta. 4669.	Nov. 19, 1904.	Lat. 12° 12.7′ S., long. 80° 25.6′ W.	300 fms. to surface. 5 specimens.
Sta. 4671.	Nov. 20, 1904.	Lat. 12° 6.9′ S., long. 78° 28.2′ W.	Surface. 1 small specimen.. 300 fms. to surface. 2 specimens.
Sta. 4676.	Dec. 5, 1904.	Lat. 14° 28.9′ S., long. 81° 24′ W.	300 fms. to surface. 3 specimens.
Sta. 4679.	Dec. 7, 1904.	Lat. 17° 26.4′ S., long. 86° 46.5′ W.	300 fms. to surface. 4 specimens.
Sta. 4681.	Dec. 8, 1904.	Lat. 18° 47.1′ S., long. 89° 26′ W.	300 fms. to surface. 1 specimen.
Sta. 4683.	Dec. 9, 1904.	Lat. 20° 2.4′ S., long. 91° 52.5′ W.	300 fms. to surface. 1 specimen.
Sta. 4701.	Dec. 26, 1904.	Lat. 19° 11.5′ S., long. 102° 24′ W.	300 fms. to surface. 4 specimens.
Sta. 4703.	Dec. 27, 1904.	Lat. 17° 18.6′ S., long. 100° 52.3′ W.	300 fms. to surface. 2 specimens.
Sta. 4705.	Dec. 28, 1904.	Lat. 15° 5.3′ S., long. 99° 19′ W.	300 fms. to surface. 33 specimens.
Sta. 4707.	Dec. 29, 1904.	Lat. 12° 32.2′ S., long. 97° 42′ W.	300 fms. to surface. 8 specimens.
Sta. 4709.	Dec. 30, 1904.	Lat. 10° 15.2′ S., long. 95° 40.8′ W.	300 fms. to surface. 40 specimens.
Sta. 4710.	Dec. 30, 1904.	Lat. 9° 30.5′ S., long. 95° 8.3′ W.	Surface. 3 small specimens.
Sta. 4711.	Dec. 31, 1904.	Lat. 7° 45.7′ S., 94° 5.5′ W.	300 fms. to surface. 11 specimens.
Sta. 4712.	Dec. 31, 1904.	Lat. 7° 5′ S., long. 93° 35.5′ W.	Surface. 4 specimens, 3 of which small, and 1 not full-grown.
Sta. 4713.	Jan. 1, 1905.	Lat. 5° 35.3′ S., long. 92° 21.6′ W.	300 fms. to surface. 29 specimens.
Sta. 4715.	Jan. 2, 1905.	Lat. 2° 40.4′ S., long. 90° 19.3′ W.	300 fms. to surface. 4 specimens.
Sta. 4716.	Jan. 2, 1905.	Lat. 2° 18.5′ S., long. 90° 2.6′ W.	600 fms. to surface. 1 specimen.
Sta. 4717.	Jan. 13, 1905.	Lat. 5° 10′ S., long. 98° 56′ W.	300 fms. to surface. 19 specimens.
Sta. 4719.	Jan. 14, 1905.	Lat. 6° 29.8′ S., long. 101° 16.8′ W.	300 fms. to surface. 17 specimens.
Sta. 4721.	Jan. 15, 1905.	Lat. 8° 7.5′ S., long. 104° 10.5′ W.	300 fms. to surface. 17 specimens.
Sta. 4722.	Jan. 16, 1905.	Lat. 9° 31′ S., long. 106° 30.5′ W.	300 fms. to surface. 17 specimens.
Sta. 4724.	Jan. 17, 1905.	Lat. 11° 13.4′ S., long. 109° 39′ W.	300 fms. to surface. 1 specimen.
Sta. 4728.	Jan. 19, 1905.	Lat. 13° 47.5′ S., long. 114° 21.6′ W.	300 fms. to surface. 1 specimen.
Sta. 4730.	Jan. 20, 1905.	Lat. 15° 7′ S., long. 117° 1.2′ W.	300 fms. to surface. 5 specimens.
Sta. 4732.	Jan. 21, 1905.	Lat. 16° 32.5′ S., long. 119° 59′ W.	300 fms. to surface. 2 specimens.

The adult males from the Pacific have no denticle on the posterior part of the lateral margin of the carapace.

The maxillae (fig. 2a) differ considerably as to the relative size of their main part and the palp from those of *N. microps*, the palp being nearly as long as the inner margin of the lobe of third joint and about half as long again as broad.

In immature specimens measuring 9–10 mm. in length the frontal plate with the not defined rostrum is longer and anteriorly more produced than in the adults, and the upper section of the eyes is considerably smaller than the lower. In still smaller specimens, 6.5–7 mm. long, the frontal plate is proportionately still longer, reaching beyond the eyes and with the distal third of the lateral margin somewhat convex and the tip itself acuminate and acute; the upper section of the eyes is much smaller than the lower, and the dorsal keel on the carapace is very conspicuous, but its highest part with the anterior margin more oblique than in the young of *N. microps* (comp. the "Siboga" paper).

One of the largest females is 18.5 mm. long; a good-sized male is 14.5 mm., but most adult specimens of both sexes are somewhat or sometimes considerably smaller.

Distribution.— The long list of Stations shows that *N. gracilis* was wanting in the most southern part of the area explored, viz. South of Lat. 20° S., that it was very common between Lat. 20° S. and the line, and that it was taken six times North of the line, northwards to near Lat. 16° N. The specimens from the six first-named of Ortmann's Stations (1894) for *N. microps* all belong to *N. gracilis*, excepting two specimens which belong to *N. tenella* G. O. S. and are mentioned below; furthermore the specimens from a single Station (from Lat. 12° 34′ N.) referred by Ortmann to *N. tenella* are also *N. graeilis*; all Ortmann's Stations in question are situated in the area where *N. gracilis* was taken in 1904–1905. Furthermore the species was taken at a number of Stations in the Indian Archipelago by the "Siboga," but is hitherto unknown from any other place and is certainly wanting in the Atlantic.

The list shows also that small specimens have been taken a few times at the surface, but that larger or full-grown specimens, with a single exception, were always taken in the vertical net from 300 fms. to the surface, and that ten specimens were taken in the bottom of the Tanner net towed at 300 fms.

29. **Nematoscelis tenella** G. O. S.

Plate 10, figs. 3a–3c.

1883. *Nematoscelis tenella* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 28.
1885. *Nematoscelis tenella* G. O. Sars, Challenger Rept., **13**, p. 133, pl. 25, figs. 5–7 (young).
1910. *Nematoscelis tenella* H. J. Hansen, Siboga-Exp., **37**, p. 110, pl. 15, figs. 4a–4m. (With full synonymy).

Sta. 4637.	Nov. 5, 1904.	Lat. 1° 31′ N., long. 86° 32′ W.	300 fms. to surface.	3 specimens.
Sta. 4638.	Nov. 6, 1904.	Lat. 0° 27′ N., long. 87° 13′ W.	300 fms. to surface.	1 specimen.
Sta. 4646.	Nov. 8, 1904.	Lat. 4° 1.6′ S., long. 89° 16.3′ W.	300 fms. to surface.	1 specimen.
Sta. 4679.	Dec. 7, 1904.	Lat. 17° 26.4′ S., long. 86° 46.5′ W.	300 fms. to surface.	1 specimen.
Sta. 4681.	Dec. 8, 1904.	Lat. 18° 47.1′ S., long. 89° 26′ W.	300 fms. to surface.	5 specimens.
Sta. 4685.	Dec. 10, 1904.	Lat. 21° 36.2′ S., long. 94° 56′ W.	300 fms. to surface.	3 specimens.
Sta. 4687.	Dec. 11, 1904.	Lat. 22° 49.5′ S., long. 97° 30.6′ W.	300 fms. to surface.	1 specimen.
Sta. 4689.	Dec. 12, 1904.	Lat. 24° 5′ S., long. 100° 20′ W.	300 fms. to surface.	5 specimens.
Sta. 4691.	Dec. 13, 1904.	Lat. 25° 27.3′ S., long. 103° 29.3′ W.	300 fms. to surface.	1 specimen.
Sta. 4699.	Dec. 25, 1904.	Lat. 21° 39.5′ S., long. 104° 29.8′ W.	300 fms. to surface.	1 specimen.
Sta. 4705.	Dec. 28, 1904.	Lat. 15° 15.3′ S., long. 99° 19′ W.	300 fms. to surface.	6 specimens.
Sta. 4707.	Dec. 29, 1904.	Lat. 12° 33.2′ S., long. 97° 42′ W.	300 fms. to surface.	7 specimens.
Sta. 4715.	Jan. 2, 1905.	Lat. 2° 40.4′ S., long. 90° 19.3′ W.	300 fms. to surface.	2 specimens.
Sta. 4716.	Jan. 2, 1905.	Lat. 2° 18.5′ S., long. 90° 2.6′ W.	600 fms. to surface.	1 specimen
Sta. 4721.	Jan. 15, 1905.	Lat. 8° 7.5′ S., long. 104° 10.5′ W.	300 fms. to surface.	6 specimens.
Sta. 4722.	Jan. 16, 1905.	Lat. 9° 31′ S., long. 106° 30.5′ W.	300 fms. to surface.	6 specimens.
Sta. 4730.	Jan. 20, 1905.	Lat. 15° 7′ S., long. 117° 1.2′ W.	300 fms. to surface.	1 specimen.
Sta. 4734.	Jan. 22, 1905.	Lat. 17° 36′ S., long. 122° 35.6′ W.	300 fms. to surface.	1 specimen.
Sta. 4742.	Feb. 15, 1905.	Lat. 0° 3.4′ N., long. 117° 15.8′ W.	300 fms. to surface.	1 specimen.

The adult males from the East Pacific — and from the Indian Archipelago — have no denticle posteriorly on the lateral margins of the carapace, while such denticles are found in males from the North Atlantic.

Fig. 3a represents the left maxillula, seen from behind; the palp is long, somewhat slender, increasing a little in breadth from the base to the obliquely truncate end, and the terminal margin has several slender setae and two stiff, nearly spiniform ones, the most distal (fig. 3b) serrate beyond the middle.— The maxillae (fig. 3c) have the palp still longer than in *N. gracilis*, as long as the inner margin of the lobe of third joint and nearly twice as long as broad.

A large female is 19.9 mm., a large male 17.8 mm. long.

Distribution.— The list of Stations shows that *N. tenella* was found in nearly the whole part South of the line of the area explored, excepting in a broad longitudinal belt along South America. As already stated, the specimens from Lat. 12° 34′ N. referred in 1894 by Ortmann to *N. tenella* belong to *N. gracilis* H. J. H.; on the other hand, one of the specimens from Hyd. Sta. 2627 (Lat. 0° 36′ N., long. 82° 45′ W.) and one of the specimens from Sta. 3414 (Lat. 10° 14′ N., long. 96° 28′ W.) referred by him to *N. microps* belong to *N. tenella*. Furthermore the species was taken in the Indian Archipelago by the "Siboga" at a number of Stations; Sars's type was captured South of the Cape of Good Hope, and finally it is known from the Eastern Atlantic between the Canary Islands and Lat. 36° 46′ N.

NEMATOBRACHION Calman. (1905).

(**Nematodactylus** Calm., 1896).

Description.— Carapace with a cervical suture and without any denticle on its lateral margins.— Eyes divided into two sections, the upper broader than the lower and with its upper surface somewhat flatly vaulted.— Antennulae similar in both sexes; peduncles at least somewhat robust; flagella long, slender, and multiarticulate.— Antennae with the spiniform process from the outer end of the subbasal joint short, about as long as the breadth of the squama; last joint of the peduncle of the endopod as long as or longer than the penultimate and not reaching the end of the squama.— Mandibles with a three-jointed palp.— Maxillulae with or without pseudexopod; the palp slender and at least rather long.— Maxillae with their main part, viz. second and third joints with their lobes, very broad in proportion to the fourth joint, the palp, which is well-marked off, and both lobes with the margin a little bifid.

First pair of thoracic legs only a little longer than the maxillipeds and of the usual structure, slender, with the short last joint a little widened below and furnished with peculiar, short setae. Second pair extremely elongate, without setae or hairs; its third joint thick; fourth joint at most as long as the

third, rather abruptly bent upwards, at a little distance from its base; before this curvature its upper edge is produced into a flat, vertical plate and at a short distance from the curvature the joint is again somewhat bent, but in the opposite direction and thus directed forwards; seventh joint two thirds to three fourths as long as the sixth, at the end with six closely set, long, serrate, stiff but thin spines, four of these projecting from the end, two from the side a little from the end. Third to fifth pairs of legs with the shape and relative length of the joints in the main as in Thysanopoda. Sixth pair of legs with the full number of joints in the somewhat short endopod and the exopod is well developed. Seventh pair with a normally developed, sometimes small exopod, while an endopod is not developed, the exopod-bearing joint terminating in a short, broad lobe with some setae.— Branchiae nearly as in Nematoscelis.— Preanal spine simple in the male, simple or bifid in the female.— Luminous organs as in Thysanopoda, etc.

The copulatory organs of first pleopods in the main as in Thysanopoda, with all lobes and five processes well developed.— No female with ovisacs has been found.

Remarks.— This interesting genus was founded by Dr. Calman on a single specimen of a new species; he named it *Nematodactylus boopis*, and correctly referred *Stylocheiron flexipes* Ortm. to the same genus without having seen any specimen. Later Calman obtained a little more material, among which a mutilated male, of *N. boopis* and then he published additions and corrections to his earlier statements and changed the name of the genus to Nematobrachion, as the former name was preoccupied. Calman's account of the genus and of his single species is very good, but as he has examined only one species, while I possess three species, and as the interesting sexual differences in antennulae and the sixth pair of thoracic legs in the other genera with divided eyes were then nearly unknown, I have thought it useful to give here a description of the genus. I must add that in 1905 I referred *Stylocheiron flexipes* Ortm. to the present genus, having overlooked that this had already been done by Calman in 1896.

According to some remarks in 1905 Calman has felt the difficulty as to the relationships of Nematobrachion and the three other genera with divided eyes and one pair of prehensile legs; in mentioning the two posterior pairs of thoracic legs he correctly pointed out their resemblance with Thysanopoda, and he states that the copulatory organs of first pleopods are "much more complex" than in Stylocheiron or Nematoscelis. Nematobrachion occupies in reality a very

isolated position between the genera with prehensile legs and divided eyes; differing widely from these genera and agreeing with Thysanopoda in having the antennulae similar in both sexes, the endopod of sixth pair of thoracic legs fully developed, five-jointed in both sexes — while in Thysanoëssa, Nematoscelis, and Stylocheiron this endopod is unjointed or two-jointed in the female and wanting in the male — and in the structure and number of processes of the copulatory organs; as to the shape of maxillulae and maxillae it is tolerably intermediate between Thysanopoda and Nematoscelis.

Key to the Species.

a. Frontal plate obtuse, without rostral process. Eyes dark brownish with a light stripe, divided by a groove and the upper section more than twice as deep as the lower which is very small. Antennular peduncles without any process from the distal outer angle of first joint, and with an at most slightly produced acute angle above near the distal outer angle of second joint. No dorsal denticles or processes on the abdominal segments.

N. boopis Calm.

b. Frontal plate terminating in a slender rostrum. Eyes black, conspicuously constricted, with the upper section only somewhat deeper than the lower. Antennular peduncles with a long, spiniform process from the distal outer angle of first joint and with a very conspicuous process from the upper, outer distal end of second joint. Conspicuous dorsal denticles on at least two of the abdominal segments.

α. The process from second antennular joint with at most the proximal half plate-shaped while the distal part is spiniform. Maxillulae without pseudexopod. Third to sixth abdominal segments each with a single dorsal spiniform process from the hind margin, that of third segment generally considerably longer than the others. Distal third of the terminal process of the copulatory organs, seen from behind, tapering to the narrow, obtuse end . . . *N. flexipes* Ortm.

β. The process from second antennular joint is a large, oblong plate slightly acuminate at the acute end. Maxillulae with pseudexopod. Fourth and fifth abdominal segments each with a dorsal row of three sharp teeth from the hind margin, but no denticle on the other segments. Distal third of the terminal process of the copulatory organs, seen from behind, very broad with the terminal margin long and incised.

N. sexspinosus H. J. H.

30. **Nematobrachion boopis** Calman.

Plate 10, figs. 4a–4d.

1896. *Nematodactylus boopis* Calman, Trans. Roy. Irish Acad., **31**, p. 17, pl. 2, figs. 19–28.
1905. *Nematobrachion boopis* Calman, Rept. Sea and Inland Fisheries of Ireland, 1902–3, pt. 2, App. **4**, p. 153, pl. 26.

Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 2 specimens (1 ♂, 1 immat.).

Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. { 300 fms. to surface. 1 specimen. / 2125 fms. to surface. 1 specimen.

Sta. 4695. Dec. 23, 1904. Lat. 25° 22′.4 S., long. 107° 45′ W. 300 fms. to surface. 1 specimen.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 2 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 32.2′ S., long. 97° 42′ W. 300 fms. to surface. 1 specimen.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 1 specimen.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 1 specimen.

Description.— Body somewhat clumsy.— The frontal plate is a very short triangle with the vertex obtuse and without any vestige of a rostrum; the lateral margins are very conspicuously raised, nearly vertical; the keel between the cervical groove and the tip of the frontal plate is rather high, with a short portion slightly in front of the middle a little more raised and feebly angular.

The eyes are extremely large, dark brownish or nearly blackish above on the somewhat flatly vaulted upper surface; somewhat lighter on the outer side, on which is seen a nearly horizontal or somewhat oblique light groove, separating the very large upper section from the lower small section which is developed only on the outer side and less than twice as high as the upper.— The antennular peduncles are short and robust, the proximal joint very considerably raised above at the distal end about as a transverse, subvertical lobe which, seen from in front, is subtriangular, much broader than high, with the vertex broadly rounded and very setose; the joint has no spiniform process at the outer distal angle. Second joint somewhat vaulted above towards the end, slightly produced above the base of third joint, with the upper outer corner of this produced part either angular or feebly projecting as a small, short tooth. Third joint with the dorsal keel rather short and moderately low.— Antennal squama somewhat narrow, tapering to the broadly rounded end and without outer distal tooth; terminal joint of the peduncle of the endopod somewhat thickened.

The maxillulae (fig. 4a) with the proximal lobe scarcely as broad as the distal, which is about as broad as long, while the palp is very slender and slightly longer than the outer margin of the distal lobe; a pseudexopod is not developed, but the lobe of the first joint is somewhat expanded in the distal direction.— The maxillae (fig. 4b) with the main part a little longer than broad; the palp

somewhat shorter than the inner margin of the lobe from third joint and twice as long as broad.— Second pair of thoracic legs with fifth joint considerably longer than the sixth.

Abdomen without dorsal processes or teeth. Preanal spine simple in both sexes.— Uropods slightly or scarcely overreaching the telson; the exopod slightly longer than the endopod.— Telson has two longitudinal keels extremely finely serrate along more than half of its length and with a very short and thin seta at each saw-tooth.

The copulatory organs (figs. 4c–4d) show some peculiarities. The spine-shaped process (p^1.) is somewhat small, well curved. The terminal process ($p.^2$) has the basal portion very much thickened and from the outer side of this part the process projects forwards, having the inner margin straight and at some distance from the end suddenly bent somewhat inwards, while the outer margin is convex and the terminal margin in the Pacific specimen obliquely and deeply emarginate[1]; the major part of the process has a flat expansion on the outer side and at the end it is peculiarly shaped, being curved somewhat backwards, as may be seen by a comparison of fig. 4c with fig. 4d. The proximal process has its proximal part very thick and directed forwards and outwards (fig. 4c, p^3.); then it bends abruptly and strongly inwards, is very slender, very long, and at the middle curved in the opposite direction, while the terminal, very thin part is curved semicircularly. The lateral process (p^4.) is rather slender, with the curved distal part short. The additional process (p^5.) as in the other species of the genus consisting of an oblong and feebly curved basal part, from the end of which projects an extremely thin distal portion directed outwards and forming with the thick part an acute angle. The median lobe long and moderately narrow; the auxiliary lobe somewhat short; the setiferous long, somewhat narrow, with setae along the distal part of the inner margin and the major part of the outer margin.

Length of the single adult male 21.5 mm., of a large female 21 mm.

Remarks.— For comparison with the two following species the above description may be useful. Calman has given (in 1905) an excellent figure of the animal; the only point with which I disagree is the position of the eye, as I never found the groove dividing it into two so vertical areas, but at most somewhat oblique and most frequently nearly horizontal.

Distribution.— *N. boopis* goes very far northwards in the Atlantic, as it

[1] In a male from the Monaco collection the terminal margin is very oblique, badly defined from the other margin and slightly incised.

has been taken West of Iceland: Lat. 65° 0′ N., long. 28° 10′ W., furthermore South of Iceland and West of the Faeroes; it was captured at a good number of Stations in the eastern part of the temperate Atlantic, as West of Ireland, West of France and southwards to the Canary Islands (several authors). Some few specimens were taken by the "Siboga" in the Indian Archipelago, and Ortmann mentions it from the waters near Hawaii. According to the foregoing list it was secured at only eight Stations in the East Pacific, sporadically in a large part of the area South of the line. It is not contained in the older rich collection of Euphausiacea in the Copenhagen Museum, taken between 1845 and 1884 by the "Galathea" Expedition and especially by Captains in the merchant marine, and judging from this fact and from the labels of the material at hand I think that *N. boopis* never occurs at the surface, but according to "Thors" catches in the North Atlantic it must sometimes occur in depths between ca. 75 and 25 fms.

31. **Nematobrachion flexipes** (Ortmann).

Plate 10, figs. 5a–5m.

1893. *Stylocheiron flexipes* Ortmann, Ergebn. der Plankton-Exped., **2**, G., b., p. 18, taf. 1, fig. 7.

Sta. 4613. Oct. 19, 1904. Lat. 9° 45′ N., long. 86° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4634. Nov. 4, 1904. Lat. 4° 35.4 N., long. 83° 32.3′ W. 300 fms. to surface. 2 specimens.
Sta. 4637. Nov. 5, 1904. Lat. 1° 31′ N., long. 86° 32′ W. 300 fms. to surface. 3 specimens.
Sta. 4649. Nov. 10, 1904. Lat. 5° 17′ S., long. 85° 19.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4650. Nov. 10, 1904. Lat. 5° 22′ S., long. 84° 39′ W. 300 fms. to surface. 1 specimen.
Sta. 4652. Nov. 11, 1904. Lat. 5° 44.7′ S., long. 82° 39.5′ W. { 200 fms. to surface. 2 specimens. / 400 fms. to surface. 1 specimen.
Sta. 4655. Nov. 12, 1904. Lat. 5° 57.5′ S., long. 80° 50′ W. 400 fms. to surface. 1 specimen.
Sta. 4663. Nov. 13, 1904. Lat. 11° 20.3′ S., long. 88° 55.2′ W. 300 fms. to surface. 4 specimens.
Sta. 4676. Dec. 5, 1904. Lat. 14° 28.9′ S., long. 81° 24′ W. 300 fms. to surface. 1 specimeen.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 1 specimns.
Sta. 4683. Dec. 9, 1904. Lat. 20° 2.4′ S., long. 91° 52.5′ W. 300 fms. to surface. 2 specimen.
Sta. 4685. Dec. 10, 1904. Lat. 21° 36.2′ S., long. 94° 56′ W. 300 fms. to surface. 1 specimen.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. 2125 fms. to surface. 3 specimens.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4691. Dec. 13, 1904. Lat. 25° 27.3′ S., long. 103° 29.3′ W. 300 fms. to surface. 1 specimen.
Sta. 4699. Dec. 25, 1904. Lat. 21° 39.5′ S., long. 104° 29.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4701. Dec. 26, 1904. Lat. 10° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 2 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 32.2′ S., long. 97° 42′ W. 300 fms. to surface. 1 specimen.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4713. Jan. 1, 1905. Lat. 5° 35.3′ S., long. 92° 21.6′ W. 300 fms. to surface. 2 specimens.
Sta. 4715. Jan. 2, 1905. Lat. 2° 40.4′ S., long. 90° 19.3′ W. 300 fms. to surface. 3 specimens.
Sta. 4717. Jan. 13, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 4 specimens.
Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 3 specimens.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 2 specimens.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 1 specimen.
Sta. 4736. Jan. 23, 1905. Lat. 19° 0.4′ S., long. 125° 5.4′ W. 300 fms. to surface. 1 specimen.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 1 specimen.

Description.— Body scarcely robust, being conspicuously more slender than in *N. boopis.*— The frontal plate is a short triangle (fig. 5a) terminating in a spiniform, long, or moderately long, horizontal rostrum which is very slender from the base and somewhat compressed. The keel between the rostrum and the cervical groove well developed.

Eyes moderately large, black, constricted somewhat below the middle, with the upper section somewhat deeper and very conspicuously thicker than the lower (fig. 5b).— The antennular peduncles longer and conspicuously thinner than in *N. boopis*; first joint with the outer margin very concave (fig. 5a), as the joint widens considerably at the outer side towards the end, and from the outer distal angle a long, spiniform process projects forwards, reaching beyond the middle of the second joint, but somewhat distant from its lateral margin; at the distal end the joint is above raised as a kind of low, subvertical, transverse, setiferous lobe. The second joint is considerably longer than broad, and above at the outer distal angle produced into a process which is lamellar at the base, tapering considerably and with the distal half or nearly two thirds spiniform (fig. 5d); the process is long, directed forwards and somewhat outwards and upwards (figs. 5c and 5d). Third joint with the dorsal keel short and rather low.— The antennal squama reaches nearly the middle of the third antennular joint, is somewhat narrow and tapers considerably to the oblique or nearly terminal margin; a distal outer tooth is very distinct; the terminal joint of the peduncle of the endopod is slender (fig. 5b).

The maxillulae (fig. 5e) with the distal lobe not broader than the proximal and conspicuously longer than broad; the palp considerably longer and broader than in *N. boopis*, overreaching considerably the distal lobe; a pseudexopod is not developed but the middle part of the lobe is somewhat expanded forwards. — The maxillae (fig. 5f) with the main part conspicuously longer than broad; the palp even a little longer than the inner margin of the distal lobe and almost twice as long as broad. Second pair of thoracic legs with fifth joint slightly or scarcely longer than the sixth.

Abdomen with a dorsal spiniform process from the hind margin of third to sixth segments; the process from third segment generally compressed and longer than any of the others, but yet varying very much in length, being sometimes moderately short, sometimes about half as long as the fourth segment; in three adult specimens this spine is rudimentary or wanting, but seems to have been broken off or damaged before the animal was captured; the three other spiniform processes vary also considerably in length; the hind margin of first and

second segments a little angular or conspicuously angular above in the middle line (fig. 5g). The lateral plates of second to fifth segments with the postero-lateral angle acute, and the plate of fifth segment besides somewhat produced (fig. 5g). Preanal spine simple in the male and with an accessory tooth in the female.— Uropods about as long as the telson; the exopod slightly or scarcely longer than the endopod.— The telson with two pairs of small dorsal spines.

The copulatory organs (figs. 5h–5m) differ from those in *N. boopis* by the shape of the terminal and the proximal processes. The terminal process is somewhat less thickened at the base, tapering to the narrow middle and then flattened and almost abruptly and strongly expanded on the outer side and feebly expanded on the inner side; the distal half is, seen from behind (fig. 5i), shaped nearly as an oblique triangle with the inner margin somewhat sinuate, the outer proximal angle very broadly rounded and the vertex narrowly rounded; a little from the distal end the posterior side shows a peculiarly raised part, the shape of which is better understood when looked at from the outer side (p^2. on fig. 5k). The proximal process is somewhat broader than in *N. boopis* and more evenly curved, its distal half is somewhat depressed, and thus broader than deep; the terminal part is much flattened and considerably expanded, forming, seen from the base of the organ, an oblong-oval plate (fig. 5m) with nearly the whole margin finely serrate. The median lobe long and slender (fig. 5h) with its two processes nearly as in *N. boopis*; the two remaining lobes nearly as in that species.

Length of a large male 21.5 mm., of a female 22.5 mm.

Remarks.— *N. flexipes* differs in general aspect much from *N. boopis*, but it would be a mistake to establish a new genus for its reception, because both species agree with each other in all characters of real generic value. It may be mentioned here that even in less than half-grown specimens the carapace has no vestige of any tooth on the lateral margins.

Distribution.— This species was established on two specimens from the Southern equatorial current in the Atlantic. The Copenhagen Museum possesses specimens from two places in the North Atlantic, viz. Lat. 31° 30′ N., long. 21° 16′ W., and Lat. 24° 3′ N., long. 25° 0′ W. It is unknown from the Indian Ocean and the Western Pacific, but according to the long list of Stations it is common in the major part of the area explored in 1904–5 in the East Pacific, viz. between Lat. 9° 45′ N., and Lat. 25° 27′ S. Ortmann has recorded it from two Stations in the same area, viz. off Panama at Lat. 6° 21′ N., and at Lat. 0° 36′ N., long. 82° 45′ W. The specimens in the Copenhagen Museum were

taken at the surface, but the occurrence there must certainly be rare, as all specimens secured in the Pacific are marked "300 fms. to surface" or, in some instances, the instrument employed had been sunk to greater depths.

32. **Nematobrachion sexspinosus** H. J. Hansen.

Plate 10, fig. 6a; Plate 11, figs. 1a–1i.

1911. *Nematobrachion sexspinosus* H. J. Hansen, Bull. Mus. Océan. Monaco, no. 210, p. 51.

Sta. 4699. Dec. 25, 1904. Lat. 21° 39.5′ S., long. 104° 29.8′ W. 300 fms. to surface. 2 adult males.

Description.— Body somewhat more clumsy than in *N. flexipes*, otherwise rather similar in general aspect.— Frontal plate nearly as in *N. flexipes*, produced in a compressed, proximally somewhat deep (fig. 1a), thin, acute, moderately long rostrum; the dorsal keel about as in the two other species.

Eyes black, conspicuously larger and especially proportionately longer than in *N. flexipes*, otherwise as in that species. The antennulae essentially as in the last-named species, excepting that the process at the outer distal angle of second joint (figs. 1b and 1c) is shaped as a large, oblong, subtriangular plate with the end acute and a little acuminate.— The antennae with the squama and the distal peduncular joint of the endopod as in *N. flexipes*.

The maxillulae (Plate 10, fig. 6a) have the distal lobe somewhat broader than the proximal and scarcely longer at the upper margin than broad; the palp is very long, considerably longer than the lobe of third joint and moderately slender; a pseudexopod (pex) is present as an oblong-oval, somewhat small plate which nevertheless reaches a little beyond the outer margin of third joint.— The maxillae (fig. 1d) with the main part only very little longer than broad; the palp is conspicuously smaller than in the two preceding species, distinctly shorter than the breadth of the lobe from third joint and somewhat less than twice as long as broad.— Second pair of thoracic legs with fifth joint scarcely longer than the sixth.

The abdominal segments without dorsal spines excepting the fourth and fifth segments, each of which has three sharp teeth projecting from the hind margin at some distance from each other (figs. 1e and 1f), and the median tooth or process is conspicuously larger than the sublateral teeth. The lateral plates of the five anterior segments with the postero-lateral angle acute and those of fifth segment produced considerably backwards (fig. 1e).— The uropods as in *N. flexipes*, but the telson with 6–8 pairs of dorsal saw-like teeth.

The copulatory organs (figs. 1g–1i) are rather similar to those of *N. boopis*,

but the three large processes show some differences. The terminal process is thickened at the base, but this thicker part does not, as in *N. boopis*, constitute a nearly right angle with the following more slender portion; furthermore the distal, expanded part is only half of the entire process, thus proportionately shorter but broader, more expanded, than in *N. boopis*, with the inner margin nearly straight and the long terminal margin somewhat incised at the middle and raised on the posterior side (fig. 1h); from the outer side (fig. 1i) this raised part is seen to be the terminal portion bent strongly backwards and forming a right angle with the posterior surface. The proximal process has its distal half regularly and semicircularly curved with the very short terminal part a little expanded and bent considerably forwards as a minute triangle (fig. 1h). The lateral process is slender and unusually long (fig. 1g), somewhat sinuate and with the incurved distal part short.

Length of the largest male 23 mm.

Remarks.— This species is interesting. In general aspect it is somewhat similar to *N. flexipes*, though conspicuously more clumsy, but by the structure of the copulatory organs and the serration on the dorsal side of the telson it is more nearly related to *N. boopis*; it differs from both species by the maxillulae which possess a real pseudexopod.

Distribution.— *N. sexspinosus* seems to be rare but widely distributed. In the enormous amount of material studied from many sources and all oceans I have found but three specimens, all males, viz. two from the East Pacific and the third from the northern temperate Atlantic (Monaco, Sta. 2105).

STYLOCHEIRON G. O. Sars (1883).

To Sars's diagnosis of this aberrant genus some additions and corrections may be made.

The carapace is always without denticles on the lateral margin.

The antennulae have in the females the second and especially the third peduncular joint slender and long, frequently even extremely long, while in the males these joints, and especially the third, are conspicuously shorter and much or very much thicker; the upper flagellum is shorter than the lower and both flagella consist of 6–10 joints, most of them proportionately long; in the females the joints are slender and round, but in the males the major distal part of each flagellum is in most species conspicuously flattened and frequently expanded, in the upper flagellum depressed, in the lower compressed; the basal joint of

the lower flagellum is long, in the male oblong-triangular, being much thickened towards the base. The peduncle of the endopod of the antennae reaches considerably beyond the end of the squama — a feature not found in any other genus — and its penultimate joint is very elongate, much longer than the terminal. The maxillae have the fourth joint either very small or badly defined, and the inner margin of both lobes is without the usual incision.

In the females the endopod of fifth pair of thoracic legs is moderately long, three-jointed, the endopod of sixth pair much larger than the small exopod and two-jointed; in the males the endopod of sixth pair is always wanting, while in fifth pair it seems to be wanting (f. inst. in *S. longicorne*) or developed as in the female (in *S. maximum*).

The copulatory organs of first pleopods have the median lobe coalesced with the inner lobe to near the end of the latter, while the former is oblong, simple, and distally rounded; the processes are small in proportion to the size of the whole organ; the spine-shaped process is curved and shaped as in several other genera, while the two other processes are at most a little curved; the lateral process is placed rather near or very near the base of the inner margin of the lobe, and an additional process is always wanting. The auxiliary lobe is placed on the inner side of the setiferous lobe and sometimes very reduced.

The genus comprises nine species, eight of which are represented in the "Albatross" collection; the only species not present is *S. insulare* H. J. H., hitherto known only from the Indian Archipelago. As to the geographical distribution numerous statements in the literature are discarded as untrustworthy, because *S. affine* H. J. H. and *S. microphthalma* H. J. H. were not separated from *S. suhmii* and this last-named species sometimes was not distinguished from *S. longicorne*. In a similar way *S. maximum* H. J. H. (1908) was not distinguished from *S. abbreviatum*.

a. *Species only with lateral setae on the penultimate joint of the elongate pair of legs.*

33. **Stylocheiron carinatum** G. O. Sars.

Plate 11, figs. 2a–2b.

1883. *Stylocheiron carinatum* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 31.
1885. *Stylocheiron carinatum* G. O. Sars, Challenger Rept., **13**, p. 137; pl. 26.
1910. *Stylocheiron carinatum* H. J. Hansén, Siboga-Exp., **37**, p. 113, pl. 16, figs. 1a–1h.

Sta. 4611. Oct. 18, 1904. Lat. 10° 33′ N., long. 88° 30′ W. Surface. 69 specimens.
Sta. 4613. Oct. 19, 1904. Lat. 9° 45′ N., long. 86° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4634. Nov. 4, 1904. Lat. 4° 35.4′ N., long. 83° 32.3′ W. 300 fms. to surface. 27 specimens.
Sta. 4635. Nov. 4, 1904. Lat. 3° 52.5′ N., long. 84° 14.3′ W. Surface. 274 specimens.
Sta. 4640. Nov. 6, 1904. Lat. 0° 39.4′ S., long. 88° 11′ W. Surface. 6 specimens.

Sta. 4644. Nov. 7, 1904. Lat. 2° 13.3′ S., long. 89° 42.2′ W. Surface. 5 specimens.
Sta. 4646. Nov. 8, 1904. Lat. 4° 1.6′ S., long. 89° 16.3′ W. 300 fms. to surface. 3 specimens.
Sta. 4661. Nov. 15, 1904. Lat. 10° 17′ S., long. 88° 2′ W. 300 fms. to surface. 1 specimen.
Sta. 4663. Nov. 16, 1904. Lat. 11° 20.3′ S., long. 88° 55.2′ W. Surface. 1 specimen.
Sta. 4665. Nov. 17, 1904. Lat. 11° 45′ S., long. 86° 5.2′ W. 300 fms. to surface. 3 specimens.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 4 specimens.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 3 specimens.
Sta. 4682. Dec. 8, 1904. Lat. 19° 7.6′ S., long. 90° 10.6′ W. Surface. 1 specimen.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. { 300 fms. to surface. 1 specimen. / 2125 fms. to surface. 1 specimen.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4699. Dec. 25, 1904. Lat. 21° 39.5′ S., long. 104° 29.8′ W. 300 fms. to surface. 2 specimens.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 3 specimens.
Sta. 4702. Dec. 26, 1904. Lat. 18° 39.5′ S., long. 102° W. Surface. 1 specimen.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 5 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 33.2′ S., long. 97° 42′ W. 300 fms. to surface. 2 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 2 specimens.
Sta. 4710. Dec. 30, 1904. Lat. 9° 30.5′ S., long. 95° 8.3′ W. Surface. 2 specimens.
Sta. 4713. Jan. 1, 1905. Lat. 5° 35.3′ S., long. 92° 21.6′ W. 300 fms. to surface. 2 specimens.
Sta. 4715. Jan. 2, 1905. Lat. 2° 40.4′ S., long. 90° 19.3′ W. 300 fms. to surface. 2 specimens.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. 600 fms. to surface. 2 specimens.
Sta. 4718. Jan. 13, 1905. Lat. 5° 32.4′ S., long. 99° 32.2′ W. Surface. 1 specimen.
Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 12 specimens.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 10 specimens.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 4 specimens.
Sta. 4727. Jan. 18, 1905. Lat. 13° 03′ S., long. 112° 44.9′ W. Surface. 1 specimen.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 6 specimens.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 1 specimen.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 4 specimens.

Furthermore this species was taken by the "Albatross" at two Stations in 1899 and 1900, and Dr. Agassiz took it several times in 1897 at the Fiji Islands.

Sta. 3681. Aug. 27, 1899. Lat. 28° 23′ N., long. 126° 57′ W. 100 fms. 1 specimen. "Albatross."
Hyd. Sta. 3998 (236). Jan. 28, 1900. Lat. 6° 34′ N., long. 170° 59′ W. Surface; electric light. 1 specimen. "Albatross."
Fiji Islands. Ringold Channel, lee side, Nukusemanu Reef. Nov. 23, 1897. 50 fms. 11 specimens.
Fiji Islands. Kimbombo, Nov. 25, 1897. 40 fms. 9 specimens.
Fiji Islands. 3 m. South of Namuka. Dec. 10, 1897. 50 fms. 9 specimens.
Fiji Islands. 6 m. South of Suva. Dec. 10, 1897. 100 fms. 6 specimens.
Fiji Islands. 5 m. South of Suva lightship. Dec. 10, 1897. 100 fms. 200 specimens.
Fiji Islands. 3 m. South of Suva lightship. Dec. 11, 1897. 100 fms. 20 specimens.
Fiji Islands. 3 m. South of Suva lightship. Dec. 16, 1897, 75 fms. 1 specimen.
Fiji Islands. 5 m. South of Suva lightship. Dec. 16, 1897. 100 fms. 8 specimens.
Fiji Islands. 5 m. South of Suva. 100–25 fms. 9 specimens.
Fiji Islands. 5 m. South of Suva. 25 fms. 3 specimens.

For comparison with the maxillulae and maxillae in species of the two other groups of this genus I have given new figures of these appendages. The maxillulae (fig. 2a) have the palp about twice as long as broad and among its terminal setae a few are solid. The maxillae (fig. 2b) are characteristic; their basal part, the first joint, is unusually long; the proximal lobe has its terminal margin very

short as compared with that of the distal lobe which is somewhat convex; the fourth joint is well defined but very small and nearly more than twice as broad as long; the exopod is badly defined and distally without any produced, free part.

The largest specimen, a female, measures 12 mm. in length, but adult specimens of both sexes are generally only 8–10 mm. long.

Remarks.— More than half-grown to full-grown specimens of this small species are easily distinguished from very young specimens of *S. abbreviatum* of similar size by the antennal squama, which in *S. carinatum* is moderately broad to the end and never reaches the middle of third joint of the antennular peduncle, while in *S. abbreviatum* the squama tapers conspicuously towards the end and reaches to near the distal end of third antennular joint. This difference is useful when the elongate second pair of legs, which differs extremely in the two species, has been lost.

It may be mentioned that a specimen from Sta. 4719 has an Epicarid fixed between the eyes, and that a male from Sta. 4724 has an Epicarid on the carapace a little from its front margin.

Distribution.— The long list of Stations in the East Pacific shows that *S. carinatum* is common in the major part of the area explored, but is wanting in a broad longitudinal belt along the coast of America from the line southwards. It is widely distributed in the Pacific according to the facts given above as to its capture in 1899 and 1900 by the "Albatross," in 1897 at the Fiji Islands by Dr. Agassiz, and Ortmann has recorded it from Lat. 28° 31′ N., long. 141° 47′ W., the Hawaiian Islands. Sars has recorded it from off Kandavu, Fiji Islands, and from off Mindanao, Philippine Islands. The "Siboga" captured it at a large number of Stations in the Indian Archipelago. It is also widely distributed in the Atlantic; Sars recorded it from "South Atlantic," Ortmann from the Sargasso Sea, the Southern equatorial current and the Brazil current; finally the Copenhagen Museum possesses it from Lat. 7° N., long. 30° W., from Lat. 17° 46′ N., long. 51° 12′ W., and from Lat. 20° 24′ N., long. 83° W. (West Indies). It has not infrequently been taken at the surface, and more than once in large numbers.

b. *Species with the elongate pair of legs terminating in false chelae having no real immovable finger but a very long and strong terminal, distally curved spine (and near this two shorter spines) on the penultimate joint.*

34. **Stylocheiron microphthalma** H. J. Hansen.

1910. *Stylocheiron microphthalma* H. J. Hansen, Siboga-Exp., **37**, p. 117, pl. 16, figs. 3a–3d.

Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 1 specimen.

Besides it has been captured two times by Dr. Agassiz in 1897: —

Fiji Islands. 5 m. South of Suva. Dec. 10, 1897. 1 specimen.
Fiji Islands. 3 m. South of Suva. Dec. 11, 1897. 100 fms. 2 specimens, ♂ and ♀.

The largest female (from Sta. 4722) is 6.7 mm. long; the male is 5.8 mm.

Distribution.— This small species was hitherto known only from five of the "Siboga" Stations in the Indian Archipelago.

35. **Stylocheiron suhmii** G. O. Sars.

Plate 11, figs. 3a–3b.

1883. *Stylocheiron suhmii* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 31.
1885. *Stylocheiron suhmii* G. O. Sars, Challenger Rept., **13**, p. 142, pl. 27, figs. 1–4.

Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. 300 fms. to surface. 3 specimens.
Sta. 4691. Dec. 13, 1904. Lat. 25° 27.3′ S., long. 103° 29.3′ W. 300 fms. to surface. 1 specimen.
Sta. 4732. Jan. 21, 1905. Lat. 16° 32.5′ S., long. 119° 59′ W. 300 fms. to surface. 1 specimen.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 1 specimen.

Besides it has been captured nine times by Dr. Agassiz in 1897: —

Fiji Islands. Ringold Channel, lee side, Nukusimanu Reef. Nov. 23, 1897. 50 fms. 4 specimens.
Fiji Islands. 3 m. South of Nanuka. Dec. 10, 1897. 50 fms. 1 specimen.
Fiji Islands. 6 m. South of Suva. Dec. 10, 1897. 100 fms. 6 specimens.
Fiji Islands. 5 m. South of Suva. Dec. 10, 1897. 100 fms. 16 specimens.
Fiji Islands. 3 m. South of Suva lightship. Dec. 11, 1897. 100 fms. 1 specimen.
Fiji Islands. 3 m. South of Suva lightship. Dec. 16, 1897. 75 fms. 1 specimen.
Fiji Islands. 5 m. South of Suva. Dec. ?, 1897. 25 fms. 1 specimen.
Fiji Islands. 5 m. South of Suva. Dec. ?, 1897. 100–25 fms. 1 specimen.
Fiji Islands. Dec. 16, 100 fms. 12 specimens.

Description.— Frontal plate rather long, in the adult females terminating in a long, distally very slender rostrum, while in adult males the rostrum is very short or scarcely developed. The dorsal keel on the gastric area moderately high, anteriorly very sloping.

The eyes are high, at least twice as high as broad (fig. 3a), somewhat pyriform, with the lower section from more than half as broad again to a little less than twice as broad as the upper; the upper section projects much above the upper end of the stalk and, seen from the side, has only three crystal cones in a transverse row.— The antennulae in the female nearly as in *S. longicorne*; the peduncle is longer than the carapace, with the two distal joints very slender and the third about one third as long again as the second; the upper flagellum is slightly shorter than the lower and about as long as the peduncle; both flagella

are extremely thin. In the male antennulae the two distal peduncular joints are somewhat shorter and much thicker than in the female; the upper flagellum is slightly longer than the peduncle and conspicuously shorter than the lower; both flagella distinctly thicker than in the female, but any expansion or flattening is not distinct, and the joints, probably eight, are difficult to count.— The antennal squama is very long and narrow, 13–14 times as long as broad a little behind the base of the marginal tooth; in the female it scarcely reaches to the middle of third joint of the antennular peduncle, in the male scarcely to the end of the same joint.— The false chelae of second pair of legs in the main as in *S. affine*.

Sixth abdominal segment (fig. 3b) a little less than twice as long as deep, with the lower margin curved moderately strongly upwards towards the end.— The rami of the uropods nearly equal in length, reaching scarcely the end of telson.

Length of the males 5–5.5 mm., of the females 5–5.8 mm.

Remarks.— It may be seen from the description that this species is very closely allied to *S. affine* H. J. H. and *S. longicorne* G. O. S. But it is easily distinguished from both by the eyes which, seen from the side, are slender, extend very much beyond the upper end of the stalk and show only three crystal cones in the transverse row.

Distribution.— The type of Sars, preserved in the British Museum, is from the Pacific, North of New Guinea. His specimen from "off Luzon, China Sea," is damaged, but seems to belong to this species. Whether the specimen from his third locality, "Samboangan to Ho-Ho, Philippines" in reality belonged to this species cannot be decided, as it seems to be lost. I discard all other statements in the literature before 1910 as uncertain, because several and perhaps many among them belong to other species; it may only be stated here that the Monaco material from the temperate North Atlantic comprises a number of specimens.

36. **Stylocheiron affine** H. J. Hansen.

1910. *Stylocheiron affine* H. J. Hansen, Siboga-Exp., **37**, p. 118, pl. 16, figs. 4a–4d.

Sta. 4609.	Oct. 18, 1904.	Lat. 11° 05′ N., long. 89° 35′ W.	300 fms. to surface.	1 specimen.
Sta. 4613.	Oct. 19, 1904.	Lat. 9° 45′ N., long. 86° 20′ W.	300 fms. to surface.	2 specimens.
Sta. 4634.	Nov. 4, 1904.	Lat. 4° 35.4′ N., long. 83° 32.3′ W.	300 fms. to surface.	16 specimens.
Sta. 4637.	Nov. 5, 1904.	Lat. 1° 31′ N., long. 87° 32′ W.	300 fms. to surface.	9 specimens.
Sta. 4638.	Nov. 6, 1904.	Lat. 0° 27′ N., long. 87° 13′ W.	300 fms. to surface.	4 specimens.
Sta. 4646.	Nov. 8, 1904.	Lat. 4° 1.6′ S., long. 89° 13.3′ W.	300 fms. to surface.	3 specimens.
Sta. 4652.	Nov. 11, 1904.	Lat. 5° 44.7′ S., long. 82° 39.5′ W.	Surface.	1 specimen.
			100 fms. to surface.	2 specimens.
			200 fms. to surface.	1 specimen.
			400 fms. to surface.	1 specimen.

Sta. 4663. Nov. 16, 1904. Lat. 11° 20.3′ S., long. 88° 55.2′ W. 300 fms. to surface. 2 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 2 specimens.
Sta. 4717. Jan. 13, 1905. Lat. 5° 10′ S., long. 98° 56′ W. 300 fms. to surface. 1 specimen.
Sta. 4722. Jan. 16, 1905. Lat. 9° 31′ S., long. 106° 30.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4740. Feb. 11, 1905. Lat. 9° 2.1′ S., long. 123° 20.1′ W. 300 fms. to surface. 2 specimens.

Besides it was taken by Dr. Agassiz in 1897: —

Fiji Islands. 5 m. South of Suva. Dec. 10, 1897. 100 fms. 1 specimen.

Distribution.— *S. affine* was captured by the "Siboga" at a number of Stations in the Indian Archipelago.

37. **Stylocheiron longicorne** G. O. Sars.

Plate 11, figs. 4a–4b.

1883. *Stylocheiron longicorne* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 32.
1885. *Stylocheiron longicorne* G. O. Sars, Challenger Rept., **13**, p. 144, pl. 27, fig. 5.
1910. *Stylocheiron longicorne* H. J. Hansen, Siboga-Exp., **37**, p. 120, pl. 16, figs. 5a–5b.

Sta. 4605. Oct. 17, 1904. Lat. 12° 21′ N., long. 92° 13′ W. 300 fms. to surface. 1 specimen.
Sta. 4637. Nov. 5, 1904. Lat. 1° 31′ N., long. 86° 32′ W. 300 fms. to surface. 5 specimens.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4685. Dec. 10, 1904. Lat. 21° 36.2′ S., long. 94° 56′ W. 300 fms. to surface. 1 specimen.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. { 300 fms. to surface. 2 specimens. / 2125 fms. to surface. 1 specimen.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4691. Dec. 13, 1904. Lat. 25° 27.3′ S., long. 103° 29.3′ W. 300 fms. to surface. 5 specimens.
Sta. 4695. Dec. 23, 1904. Lat. 25° 22.4′ S., long. 107° 45′ W. 300 fms. to surface. 3 specimens.
Sta. 4699. Dec. 25, 1904. Lat. 21° 39.5′ S., long. 104° 29.8′ W. 300 fms. to surface. 4 specimens.
Sta. 4701. Dec. 26, 1904. Lat. 19° 11.5′ S., long. 102° 24′ W. 300 fms. to surface. 2 specimens.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 1 specimen.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4721. Jan. 15, 1905. Lat. 8° 7.5′ S., long. 104° 10.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 3 specimens.
Sta. 4728. Jan. 19, 1905. Lat. 13° 47.5′ S., long. 114° 21.6′ W. 300 fms. to surface. 5 specimens.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2′ W. 300 fms. to surface. 5 specimens.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4736. Jan. 23, 1905. Lat. 19° 0.4′ S., long. 125° 5.4′ W. 300 fms. to surface. 1 specimen.

Figs. 4a–4b represent the left maxillula and left maxilla, giving an idea of these appendages in a species of this group of the genus. The maxillulae differ from those in *S. carinatum* only in minor particulars; thus the third joint is comparatively broader and the palp is broader with a much larger number of setae. The maxillae (fig. 4b) are more interesting; the fourth joint is not at all marked off, not even at the inner margin, from the third joint with its lobe, but judging from the place of the distal end of the insertion of the exopod the fourth joint is moderately long; the exopod is well-marked off and distally produced with a free lobe beyond the end of the articulation.

This species varies much in size; the largest female (from Sta. 4699) is 13 mm. long.

Remarks.— It may be mentioned that one of the specimens from Sta. 4637 has an Epicarid on the lower side of the thorax between the posterior legs.

Distribution.— The list of Stations shows that *S. longicorne* is rather common in some parts of the area explored in 1904–1905, but seems to be wanting in other parts, for instance near the Galapagos, in a rather large field Southwest and South of these Islands, and in a broad longitudinal belt along the coast of South America. The specimen from the Hawaiian Islands referred (1905) by Ortmann to *S. suhmii* belongs to *S. longicorne*. This species was gathered by the "Siboga" at nine Stations in the Indian Archipelago. Sars's type was taken South of the Cape of Good Hope, and Sars states that he had some specimens from the Mediterranean. In the Atlantic it is evidently not uncommon and has been captured as far northwards as South of Iceland, Lat. 63° 08′ N., long. 21° 30° W. ("Ingolf" Exp.).— It has very rarely been taken at the surface.

38. **Stylocheiron elongatum** G. O. Sars.

1883. *Stylocheiron elongatum* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 32.
1885. *Stylocheiron elongatum* G. O. Sars, Challenger Rept., **13**, p. 146, pl. 27, figs. 6–10.

Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 1 specimen.

This slender species is easily recognized by its extremely long sixth abdominal segment. Sars's description and figures are imperfect as to some particulars, but a new representation based on good material must be postponed for the report on the Monaco material.

Distribution.— Only the single above-named specimen is hitherto known from the Pacific, and it is unknown from the Indian Ocean. Sars's two specimens were from the South Atlantic. Ortmann had it from several areas in the Atlantic, viz.:—the Florida current, Sargasso Sea, Northern equatorial current, Guinea current and Southern equatorial current. In 1905 I enumerated a number of localities in the Eastern Atlantic between Lat. 36° 17′ N. and Lat. 27° 43′ N.

c. *Species with the elongated pair of legs terminating in real chelae with a well-developed immovable finger from the penultimate joint.*

39. **Stylocheiron abbreviatum** G. O. Sars.

Plate 11, figs. 5a–5f.

1883. *Stylocheiron abbreviatum* G. O. Sars, Forh. Vid. Selsk. Christiania for 1883, no. 7, p. 33.
1885. *Stylocheiron abbreviatum* G. O. Sars, Challenger Rept., **13**, p. 147, pl. 27, figs. 12–13.
1896. *Stylocheiron chelifer* Chun, Bibl. Zool., **7**, heft. 19, p. 162, taf. 1, figs. 1–8.
1910. *Stylocheiron abbreviatum* H. J. Hansen, Siboga-Exp., **37**, p. 122.

Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 3 specimens.
Sta. 4681. Dec. 8, 1904. Lat. 18° 47.1′ S., long. 89° 26′ W. 300 fms. to surface. 2 specimens.
Sta. 4685. Dec. 10, 1904. Lat. 21° 36.2′ S., long. 94° 56′ W. 300 fms. to surface. 4 specimens.
Sta. 4687. Dec. 11, 1904. Lat. 22° 49.5′ S., long. 97° 30.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4689. Dec. 12, 1904. Lat. 24° 5′ S., long. 100° 20′ W. 300 fms. to surface. 1 specimen.
Sta. 4691. Dec. 13, 1904. Lat. 25° 27.3′ S., long. 103° 29.3′ W. 300 fms. to surface. 3 specimens.
Sta. 4695. Dec. 23, 1904. Lat. 25° 22.4′ S., long. 107° 45′ W. 300 fms. to surface. 1 specimen.
Sta. 4699. Dec. 25, 1904. Lat. 21° 39.5′ S., long. 104° 29.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4705. Dec. 28, 1904. Lat. 15° 5.3′ S., long. 99° 19′ W. 300 fms. to surface. 2 specimens.
Sta. 4707. Dec. 29, 1904. Lat. 12° 33.2′ S., long. 97° 42′ W. 300 fms. to surface. 5 specimens.
Sta. 4709. Dec. 30, 1904. Lat. 10° 15.2′ S., long. 95° 40.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4719. Jan. 14, 1905. Lat. 6° 29.8′ S., long. 101° 16.8′ W. 300 fms. to surface. 1 specimen.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 1 specimen.
Sta. 4730. Jan. 20, 1905. Lat. 15° 7′ S., long. 117° 1.2 W. 300 fms. to surface. 1 specimen.
Sta. 4734. Jan. 22, 1905. Lat. 17° 36′ S., long. 122° 35.6′ W. 300 fms. to surface. 1 specimen.

Besides I have it from the following localities:—

Sta. 3681. Aug. 27, 1899. Lat. 28° 23′ N., long. 126° 57′ W. 100 fms. 2 specimens. "Albatross."
Fiji Islands. 6 m. South of Suva lightship. Dec. 11, 1897. 150 fms. 1 specimen. A. Agassiz.
Fiji Islands. 3 m. South of Suva lightship. Dec. 11, 1897. 100 fms. 1 specimen. A. Agassiz.
Fiji Islands. 3 m. South of Suva lightship. Dec. 11, 1897. 150 fms. 1 specimen. A. Agassiz.

In the "Siboga" paper I pointed out the main differences between this species and *S. maximum* H. J. H. But as no adult male was found in the "Siboga" material, as the copulatory organs have never been figured, and the interesting antennulae in adult males are unknown I give some figures of these and other parts with the necessary description; the preservation of the females in the collection does not allow corresponding figures of the antennular flagella in this sex.

Fig. 5a exhibits the anterior part of a male. The eye has the shape characteristic in this species; it is nearly pyriform, the lower area being somewhat or a little less than twice as broad, but more than twice as deep as the upper.— In the female the antennulae have the two distal peduncular joints slender as in the other species of the genus, and the third joint is conspicuously, though not much, longer than the second; the flagella are slender with round joints. In the male the second and especially the third joint of the antennular peduncles is much thickened, the second slightly shorter than in the female, but the third slightly shorter than the second and gradually more thickened towards the end. The male antennular flagella are very characteristic (figs. 5b and 5c); the upper flagellum is somewhat shorter than the peduncle (fig. 5a), 6-jointed; the four proximal joints rather slender, but the first a little expanded towards the base, the second extremely short, and the fourth is distinctly depressed and begins to be a little expanded; the two distal joints together considerably longer than the sum of the four proximal joints, flattened, the fifth distally much expanded inwards with the inner margin of the broadest part finely serrate, the sixth

joint oblong-triangular, a little longer than the fifth and finely serrate along the inner margin. The lower flagellum is not fully half as long again as the upper, 9-jointed, the basal joint long and extremely thickened towards the base, with a large tuft of innumerable, thin sensory setae; the second joint is extremely short, the third long and slender, the fourth much shorter, compressed, and distinctly widened towards the end, while the five distal joints increase in length to the last, all being besides strongly compressed, with the upper margin finely serrate.

The antennal squama is long, rather narrow, tapers towards the end, with an outer tooth reaching beyond the short, oblique or transverse terminal margin; it reaches in the male to or a little beyond the end of third joint of the antennular peduncle (fig. 5a), in the female beyond the middle of that joint but never to its end; the two distal joints of the special peduncle of the endopod (a^2) are very thin and taken together extremely long, reaching far behind the end of the squama.

The maxillulae (fig. 5d) differ only in minor details from those of *S. longicorne* (fig. 4a) and the same is the case with the maxillae (fig. 5e), the latter being, however, proximally somewhat broader in proportion to the length and have the fourth joint marked off at the inner margin from the lobe of third joint.

Fig. 5f, representing the inner and the median lobe of the copulatory organ, illustrates especially the great difference in thickness between the terminal and the proximal process (p^2. and p^3.) which, as pointed out in the "Siboga" paper, is the best specific character in this organ for *S. abbreviatum* in contradistinction to *S. maximum*. (The copulatory organ of the latter species has been figured in the paper named).

Length of a good-sized male 15 mm., of a female 16 mm.

Distribution.— Most of the localities enumerated in the literature are not trustworthy, because the next species has frequently been confounded with *S. abbreviatum*. Sars's type is from the tropical Atlantic, and the Copenhagen Museum possesses two specimens from the same area, viz. Lat. 23° 31′ N., long. 22° 41′ W., and Lat. 18° S., long. 2° W.; a number of specimens are at hand from the area in the northern temperate Atlantic explored by the Prince of Monaco. Furthermore it has been captured at some Stations in the Indian Archipelago by the "Siboga." It is widely distributed in the Pacific; according to the list of Stations, Expedition of 1904–1905, it is rather common in the southern part in the area explored, going northwards to about Lat. 6½° S.; but

furthermore it was taken at the Fiji Islands and in the North Pacific; Ortmann's specimen from the Hawaiian Islands belongs to this species, while his specimen from off Galera Point is too poor for determination.— The species has very rarely been taken at the surface.

40. **Stylocheiron maximum** H. J. Hansen.

1908. *Stylocheiron maximum* H. J. Hansen, The Danish Ingolf-Exped., **3**, 2, p. 92.
1910. *Stylocheiron maximum* H. J. Hansen, Siboga-Exp., **37**, p. 121, pl. 16, figs. 6a–6d.

Sta. 4646. Nov. 8, 1904. Lat. 4° 1.6′ S., long. 89° 16.3′ W. 300 fms. to surface. 1 specimen.
Sta. 4679. Dec. 7, 1904. Lat. 17° 26.4′ S., long. 86° 46.5′ W. 300 fms. to surface. 1 specimen.
Sta. 4707. Dec. 29, 1904. Lat. 12° 32.2′ S., long. 97° 42′ W. 300 fms. to surface. 1 specimen.
Sta. 4713. Jan. 1, 1905. Lat. 5° 35.3′ S., long. 92° 21.6′ W. 300 fms. to surface. 1 specimen.
Sta. 4716. Jan. 2, 1905. Lat. 2° 18.5′ S., long. 90° 2.6′ W. 600 fms. to surface. 1 specimen.
Sta. 4724. Jan. 17, 1905. Lat. 11° 13.4′ S., long. 109° 39′ W. 300 fms. to surface. 2 specimens.
Sta. 4742. Feb. 15, 1905. Lat. 0° 3.4′ N., long. 117° 15.8′ W. 300 fms. to surface. 1 specimen.

Remarks.— The material is somewhat poor in quality, most of the specimens being not well preserved and only two, both females, are adult. For this reason a representation of this large and fine species must be postponed.

Distribution.— In the Atlantic *S. maximum* extends northwards to Lat. 61° 49′ N., long. 14° 11′ W., West of the Færoes ("Ingolf" Exp.), and it is not uncommon in the area explored by the Prince of Monaco. Finally it was taken at some few localities in the Indian Archipelago by the "Siboga."

LARVAL STAGES OF EUPHAUSIACEA.

Plate 12.

The collection contains a large number of larvae in various stages of development. But more than two thirds belong to the genus Euphausia and are not very interesting; a smaller number in the later stages of development can be named with certainty, but it is impossible to refer most of them to the forms to which they belong. Sars has given a very detailed account of the metamorphosis of his *Euphausia pellucida*, and though this species — according to his list of synonymy, his figures, and many of his specimens examined by me — comprises at least three allied species, and though it is impossible to decide whether the larvae described and figured by him as stages of *E. pellucida* in reality belong to a single or to two or three closely allied species, his figures and descriptions do give an excellent account of the development of animals of the *krohnii*-group. The time is still remote when it may be possible to give a full account of the metamorphosis of at least several species of the rich genus Euphausia, a task

which, for the others, must always be very difficult, as frequently it will be next to impossible to find specific characters for every stage of every species. As the number of species of the genus Euphausia collected by the Agassiz expedition 1904–1905 is fourteen, and it may be expected that larvae of the majority of these species exist in the material, it will instantly be seen that to solve the difficulties connected with the endeavour to refer the older larval stages to their proper form and then in a similar way to proceed from older to younger stages would have been in most cases at least very great and sometimes or frequently impossible. Under such circumstances I thought it better not to make a hazardous attempt to work out the material of these larvae, with the exception of some few presenting a somewhat peculiar aspect and belonging to a single species. But I thought it useful and safer to describe a number of larvae of five other genera, hoping thereby to give an addition of some little importance to our knowledge of the larvae of this order, especially as I am able to refer most of these larvae to the species in question.

THYSANOPODA sp. (T. MONACANTHA aff.).

Plate 12, figs. 1a–1g.

A. *First Furcilia-Stage* (figs. 1a–1d).— The frontal plate (fig. 1b) very long, nearly as long as broad at the base; its lateral margins proximally concave, more distally convex and then almost straight to the slightly acuminate, acute tip; the upper surface a little concave longitudinally.— The carapace has a fine denticle on the lower margin somewhat before its posterior end (fig. 1a); seen from the side a short, but somewhat high keel, including the dorsal organ, is seen on the upper margin considerably nearer to the posterior margin than to base of the frontal plate.— The eyes are large, yellow with the central part black, but they do not reach beyond the sides of the carapace (fig. 1b), as their stalks are short.— The antennular peduncles short and very robust; first joint extremely broad, with its distal outer process reaching the end of third joint and furnished with fine spines on the inner margin; second joint broader than long with two very long, plumose setae on the inner margin; third joint nearly half as long again as the second and a little longer than broad, with terminal setae and three very long, plumose setae on the inner margin; both flagella are one-jointed, the upper much shorter and thinner than the lower which is a little shorter than the third peduncular joint.— The antennae (figs. 1a and 1b) with both rami one-jointed and terminating in a bundle of extremely long, plumose

setae; outer ramus much shorter than the inner.— The maxillipeds (fig. 1a, mxp.) with the exopod longer than the endopod.— First pair of thoracic legs are only short, simple protuberances, and no distinct vestige of following pairs is observed.

The abdomen (fig. 1a) with the upper part of second segment distinctly elongate and dorsally a little protruding towards the hind margin; sixth segment as long as the sum of the two preceding segments and somewhat longer than deep.— First pair of pleopods shaped as a very oblong, naked joint; the following pleopods visible only as low knots covered by the "epimera."— The uropods (fig. 1c) reach conspicuously beyond the middle of the telson.— Telson almost two and a half times as long as sixth segment, scarcely three and a half times as long as broad and narrower somewhat from the end than at the base; its end (fig. 1d) with seven moderately short, distally very slender spines, and at each side near the end three spines, the distal long and very strong with fine spines along more than the proximal half of its inner margin, the intermediate spine a little less strong but still somewhat longer than the distal and showing similar armature; the proximal spine strong but only one third as long as the next.

Length 3.7 mm.

The two specimens described are from "Albatross" Sta. 4635, November 4, 1904; surface. A third specimen from the same Station is intermediate between the first and the last Furcilia-stage.

B. *Last Furcilia-Stage* (figs. 1e–1g).— The frontal plate (fig. 1f) a little shorter and somewhat broader than in the first Furcilia-stage; the dorsal keel is smaller and situated nearer to the base of the frontal plate than to the posterior margin of the carapace (fig. 1e).— The antennulae are somewhat longer (fig. 1f); the process from first joint reaches the middle of the third joint; the second joint nearly longer than broad; the lower flagellum as long as the third peduncular joint and somewhat longer than the upper flagellum. The antennae and the maxillipeds essentially as in the preceding stage.— The first pair of thoracic legs not longer than the maxillipeds, with the endopod divided into some joints, the exopod very short and two branchial filaments; second pair nearly rudimentary with a four-branched gill; third pair rudimentary with a small three-branched gill.

Second abdominal segment protrudes as in the preceding stage; sixth segment more than half as long again as deep.— First pair of pleopods with both rami present and setiferous but the endopod is very short; second pair a little

shorter with the exopod setiferous but no endopod. Third to fifth pair nearly rudimentary, oblong, with a transverse suture but without setae.— The uropods reach nearly the proximal pair of spines on the terminal part of the telson. This terminal part (fig. 1g) is very different from that of first Furcilia-stage; the terminal margin is convex with only five spines and the median spine longer and stronger than the others, which are a little shorter than in the earlier stage; of the distal lateral spines the intermediate pair are nearly as in the preceding stage (in the single specimen the left spine is normal, the right shorter and without fine marginal spines), the proximal pair are short and slender, while the distal pair are longer and stronger than the intermediate, straight, with only two or three fine spines on the inner margin.

Length of the single specimen 5 mm.

The specimen is from "Albatross" Sta. 4710; December 30, 1904. Surface.

Remarks.— That the two stages described belong to the same species is easily seen from the shape of the frontal plate, the antennulae, the eyes, and the second abdominal segment. It is closely allied to *T. monacantha* Ortm. (*T. agassizii* Ortm.) but can scarcely be that species. The "Siboga" material contained specimens of the last Furcilia-stage, furthermore a young animal in which the process from the two proximal antennular joints had begun to develop — so that this specimen could with absolute certainty be referred to *T. monacantha* — and besides two stages intermediate between the last-named specimen and the last Furcilia-stage, and it is quite sure that all these specimens belong to the same species. But the specimens in the last Furcilia-stage from the "Siboga" differ from the specimen in the Agassiz collection just described by having the body a little shorter and somewhat more clumsy, the eyes somewhat larger, the frontal plate a little different in shape, the second abdominal segment less protruding above and besides showing an interesting difference in the telson. Though the thoracic and abdominal appendages show the same degree of development in the specimens in last Furcilia-stage from both collections, the Agassiz specimen, which is a little longer than those from the "Siboga," has the distal part of the telson less developed than the "Siboga" specimens, as the long postero-lateral spines of the intermediate pair found in the Agassiz specimen are lost in the "Siboga" specimens (Siboga-Exp., **37**, pl. 13, fig. 3g).

It is, I think, very improbable that the differences pointed out between specimens in the last Furcilia-stage from the Indian Archipelago and the tropical East Pacific can be found in larvae of the same species from two distant areas.

And after a renewed examination of the "Siboga" material I consider my interpretation or reference of these animals as quite certain. The above-described larvae must therefore belong to a species allied to *T. monacantha* (*T. agassizii*) and according to my knowledge of young animals of *T. pectinata*, *T. orientalis*, *T. aequalis*, and *T. obtusifrons* they cannot belong to any of these forms, but most probably to *T. cristata* G. O. S., which is larger than *T. monacantha* and agrees with it in having a lateral furrow somewhat above the lower margin of the carapace.

Euphausia distinguenda H. J. Hansen.

Plate 12, figs. 2a–2c.

Last Furcilia-Stage.— Slender.— The frontal plate (fig. 2b) is large, scarcely twice as broad as long, anteriorly very broadly rounded but with a quite minute acute tooth representing the rostrum. The dorsal keel of the carapace situated nearly equally distant from the rostrum and from the posterior margin; it is high, subtriangular, with the front margin rather steep; the tooth situated far behind on the lateral margins of the carapace is large.

The eye-stalks are uncommonly long, almost longer than broad (fig. 2b) and conspicuously longer than deep (fig. 2a).— The antennulae are half developed; the distal process from the first peduncular joint reaches not fully to the end of third joint; the flagella are equal in length, somewhat longer than the sum of the two distal peduncular joints, three-jointed.— The antennae have the exopod somewhat shorter than the endopod and not yet developed as squama.— The maxillipeds with both rami equal in length and the exopod one-jointed.— First pair of thoracic legs twice as long as the maxillipeds; endopod with the full number of joints with only a few short setae at the end; the exopod not quite half as long as the endopod; a minute bipartite branchia is visible. Second pair of legs nearly rudimentary, with a minute branchial rudiment; third pair scarcely visible.

The four anterior pairs of pleopods with both rami setiferous; the exopod as long as the stalk, while the endopod is minute. Fifth pair of pleopods small, naked, with a transverse suture.— Distal part of telson (fig. 2c) with three terminal spines, the intermediate spine somewhat longer than the others, and with three pairs of lateral spines, the distal pair a little longer than and twice as broad as the intermediate, while the proximal pair are minute.

Length of the specimen described and figured 2.8 mm.

The specimen is from the "Albatross" Sta. 4588; October 12, 1904. Surface.

Remarks.— The reference of this larva to *E. distinguenda* H. J. H. is certain, because I have a nearly complete series of the following stages of development and growth up to the adult specimens. The larvae of the stage described are distinguished from those of other species by the combination of possessing a slender body, a high and anteriorly steep dorsal keel and somewhat long eye-stalks. A comparison between the larvae just described with the corresponding stage described and figured by Sars as belonging to *E. pellucida* ("Challenger" Rept., pl. 29, fig. 7 and pl. 30, fig. 40) is not without interest. In certain respects Sars's larva is more, in other features less, developed than the larva of *E. distinguenda*; *E. pellucida* has the second pair of thoracic legs considerably longer than *E. distinguenda*, and the last pair of pleopods with both rami setiferous, while the telson has still seven terminal spines and the antennular flagella are a little less developed than in *E. distinguenda*.— Similar cases of differences in the development between various species of the genus Euphausia have been pointed out in my paper on the Schizopoda of the Belgian Antarctic Expedition.

Nyctiphanes simplex H. J. Hansen.

Plate 12, figs. 3a–3f.

A. *Intermediate Furcilia-Stage* (figs. 3a–3d).— The frontal plate (fig. 3b) very large, somewhat less than twice as broad as long, longitudinally concave and anteriorly cut off, with the front margin about half as long as the basal breadth of the plate and conspicuously concave but not angular at the middle; the antero-lateral angles feebly produced, acute.— The carapace has a well-developed tooth on the lateral margin, while the usual dorsal keel is very short and low, placed a little farther from the end of the frontal plate than from the posterior margin.

The eyes are extremely large with moderately long stalks.— The antennulae are very thick; the process from first peduncular joint reaches beyond the middle of the third; second and third joints slightly longer than broad; the upper flagellum thick, nearly conical, unjointed and a little longer than the lower.— Antennae with the rami subsimilar in shape, but the exopod a little shorter than the endopod.— Maxillipeds (mxp.) with the exopod a little shorter than the endopod.— First pair of thoracic legs scarcely as long as the maxillipeds, with a rudimentary exopod and a small two-branched gill; the endopod has one distinct and two indistinct articulations. Second pair half as long as the first, with a rudimentary branchia; third pair quite rudimentary.

First and second pairs of pleopods with the exopod well developed, seti-

ferous, while the endopod is minute and naked. The three posterior pairs somewhat shorter than the second pair; the exopod well defined, as long as the stalk and without terminal setae.— Sixth abdominal segment somewhat longer than the fifth and rather thick.— The uropods reach a little beyond the middle of telson.— The telson (fig. 3c) is a little broader near the end than at the base. The terminal margin (fig. 3d) transverse, straight, with seven spines, which increase somewhat in length from the median spine outwards and have the proximal major part at each side furnished with minute denticles; the intermediate pair of postero-lateral spines slightly longer and a little less thick than the inner pair, which is more than twice as long as the outer terminal spine; the outer postero-lateral spine less than half as long as the intermediate pair.

Length of the specimen described 3.2 mm.

Last Furcilia-Stage (figs. 3e–3f).— Carapace with frontal plate almost as in the preceding stage.— Antennulae considerably longer, but the process from the first joint is still as long as in the stage described, while the flagella are about as long as the sum of the two distal peduncular joints, setiferous at the end but with articulations very indistinct; the lower flagellum is a little longer and considerably thicker than the upper.— Antennae still as in the intermediate stage.— The endopod of the maxillipeds somewhat longer and thicker than the exopod, with a few feeble articulations.— First pair of thoracic legs considerably developed; the endopod reaches the base of the antennae, is distally setiferous and with the final number of joints; the exopod still unjointed and without setae; the gill with two long branches and one very short branch.— Second pair somewhat less developed than the first, as the endopod is somewhat shorter, but yet with the end setose and the full number of joints, while the gill-branches are a little shorter than in first legs.— Third pair of legs less than half as long as second pair but with the gill quite similar; the two next pairs of legs are small rudiments.

The three anterior pairs of pleopods have the endopod almost half as long as the exopod and distally setiferous; in the two posterior pairs the exopod is well developed, setiferous, while the endopod is small and naked.— Sixth abdominal segment as usually conspicuously longer than in the intermediate stage; its uropods reach somewhat beyond the middle of the telson (fig. 3e).— The telson (figs. 3e and 3f) is a little more than four times as long as broad and slightly broader at the base than somewhat before the end; the terminal margin is a good deal shorter than in the preceding stage, but still with the seven spines, which are even somewhat smaller than before; among the postero-lateral spines

the two outer pairs are nearly as in the preceding stage, but the inner pair are almost twice as broad.

Length of the specimen described 3.7 mm.

Remarks.— By the distally broad and emarginate frontal plate the larvae of Nyctiphanes and Pseudeuphausia differ strongly from those of all other Euphausiacea. The above-described larvae were chosen among a good number of larvae and young and adult specimens from Sta. 4655, Nov. 12, 1904, Surface. Young specimens with the frontal plate distally emarginate and the characteristic lobe of first antennular joint high but not yet fully developed have been described on p. 228. This lobe begins to protrude conspicuously in a specimen measuring about 4.5 mm., and in this specimen the telson has nearly acquired its final shape. Specimens measuring 4.5–5 mm. are therefore easy to determine by aid of the lobe mentioned as Nyctiphanes, for *Pseudeuphausia latifrons* G. O. S. does not possess such a high protuberance; the differences between larvae of *Nyctiphanes simplex* still without the antennular lobe and stages of Pseudeuphausia of the same size are pointed out below.

The larvae described show that they acquire a rather considerable size before the appendages are half developed and before the end of the telson begins to lose its larval armature, though adult specimens are rather small. The distal process of first antennular joint remains very long until the specimens are considerably more than half grown, and the dorsal carina of the carapace is very small even in the youngest larva described.

Pseudeuphausia latifrons G. O. Sars.

Plate 12, figs. 4a–4b.

As stated above, Dr. Agassiz collected at the Fiji Islands a number of specimens, among which are a few larval forms; and from the "Siboga" I have several larvae in the Furcilia- and Calyptopis-stages. And they are mentioned chiefly for comparison with those of *Nyctiphanes simplex*.

The larvae of Pseudeuphausia differ from those of *Nyctiphanes simplex* especially in three features, viz. they are, when chosen in the same stage, considerably smaller, their antennular peduncles are more slender and the frontal plate is not only *more deeply emarginate*, but the emargination is not rounded, but *angular at the middle*. The anterior and the posterior parts of the youngest Agassiz specimen are rendered in figs. 4a and 4b, and a view on these figures shows that the antennular flagella and the telson are considerably more developed than in the above-described specimen in last Furcilia-stage of Nyctiphanes,

though the specimen is only 3.2 mm., thus as long as the intermediate Furcilia-stage of Nyctiphanes; it may be added that the thoracic legs are also somewhat more developed than in the last Furcilia-stage of Nyctiphanes measuring 3.7 mm. Fig. 4b shows that the telson tapers gradually to the insertion of the outer pair of postero-lateral spines, that the intermediate pair of these spines are very slender, the inner pair somewhat strong with the fine denticles along their inner margin, while the telson itself is produced in an acute spine and the terminal spines are wanting.

A specimen in the intermediate Furcilia-stage (from the "Siboga") is 2.7 mm. long; its pleopods are developed about as in the same stage of Nyctiphanes, while its antennular flagella and two anterior pairs of thoracic legs are a little more developed than in the latter form. But the telson is quite different, as to shape of itself and relative size of the three pairs of postero-lateral pairs similar not to the first but to the last Furcilia-stage of Nyctiphanes, while the terminal transverse margin of telson is short with only three small spines.

Nematoscelis microps G. O. Sars.

Plate 12, figs. 5a-5c.

Last Furcilia-Stage.— The frontal plate is very long, linguiform, longitudinally somewhat excavated, anteriorly broadly rounded at the sides and at the middle produced in a very small, tooth-shaped rostrum (fig. 5b); the dorsal keel of the carapace is long and high, oblong-triangular, with the upper angle rounded and the front margin rather steep, situated a little nearer to the posterior margin than to the rostrum; the tooth on the lateral margins of the carapace is very large, directed much downwards and originating at the posterior margin (fig. 5a).

The eyes have the lower section rather well developed, but the upper section is very small.— The antennular peduncles are rather slender; the process from the first joint does not reach the end of second joint, which is a little more than twice as long as thick and conspicuously shorter and thicker than the third; the flagella are very short, unjointed; the lower with a single terminal seta (omitted in the figures).— Antennae and maxillipeds completely larval in shape and tegumental surface; the exopod of the maxillipeds a little longer than the endopod.— First thoracic legs somewhat developed; the endopod reaches slightly in front of the end of rostrum, has the full number of joints with last joint terminating in a few spines; a branchial lobe is visible.— Second thoracic legs rather small, with the endopod scarcely twice as long as the exopod and the branchia

lobes somewhat short and broad; of third pair of legs only the branchia is discernible.

The four anterior pairs of pleopods with the exopod well developed, setiferous, while the endopod is very small with a single seta. Fifth pair of pleopods small, with the naked exopod marked off.— The uropods reach considerably beyond the middle of telson; the endopod is longer than the exopod.— Telson tapers in breadth from the base to a little before the outer postero-lateral spines; the distal part is intermediate as to shape and spines between the earlier larval stages and the fully developed specimens; in the earlier stages three pairs of postero-lateral spines and seven terminal spines are found, while in the adult the intermediate pair of lateral spines and all terminal spines are wanting; in the specimen mentioned here the terminal margin is short with three spines, the middle spine much shorter than the submedian spines, each of which has a strong spiniform denticle on each side before the middle; furthermore, the intermediate pair of postero-lateral spines are lost, while the inner pair are extremely broad, very long and furnished with a number of fine spines on the major proximal part of the inner margin.

The specimen described is 3.5 mm. long.

Remarks.— The shape and tegument with spines of the first pair of thoracic legs proves that the specimen — taken at Hyd. Sta. 3789, Lat. 2° 38′ N., long. 137° 22′ W., September 9, 1899, Surface — belongs to the genus Nematoscelis; furthermore among the species of this genus it must, according to the shape of the eyes and the strong development of the dorsal keel, belong to either *N. microps* G. O. S. or *N. gracilis* H. J. H. And judging from the very high and anteriorly steep dorsal keel I have referred it to *N. microps*.

Whether the specimen described shall be referred to the last Furcilia-stage or the first Cyrtopia-stage is almost a matter of free choice. But it may be of some interest to compare it with the above-described larva of *Euphausia distinguenda*. In both larvae the four anterior pairs of pleopods are setiferous, the thoracic legs are nearly equally developed and the end of the telson has only three marginal spines, but in *E. distinguenda* the intermediate postero-lateral pair of spines which have been lost in Nematoscelis, are still preserved, while, on the other hand, the antennular flagella are very short and unjointed in the latter, but somewhat elongate and three-jointed in the former species. This is a new instance of the above-mentioned fact that as to the consecutive order of the development of appendages and telson considerable differences are found in this order.

Stylocheiron carinatum G. O. Sars.

Plate 12, figs, 6a–6d.

Intermediate Furcilia-Stage (figs. 6a–6c).— The frontal plate with rostrum constitutes a rather large triangle almost as long as broad and with the lateral margins somewhat concave and the end very acute; the dorsal keel of the carapace is low and placed much behind its middle; the lateral margins of the carapace are without any tooth.

The eyes have the lower section well developed, while the upper is small.— The antennular peduncles are rather slender; the process from first joint reaches a little beyond the end of next joint; second joint almost twice as long as broad, somewhat shorter than the third; flagella unjointed, upper flagellum much shorter and thinner than the lower which is about half as long as third peduncular joint.— Antennae and maxillipeds showing the usual larval development; two anterior pairs of thoracic legs rudimentary.

First pair of pleopods with the exopod setiferous; the two following pairs are very oblong, undivided; the posterior pairs rudimentary, scarcely visible below the margin of the lateral plates.— Sixth abdominal segment as long as the sum of the two preceding segments.— The uropods reach much beyond the middle of the telson.— Telson is four and a half times as long as broad, with the distal part somewhat narrower than the proximal; the terminal margin (fig. 6c) is long, with seven rather long, naked spines, increasing in length from the median spine to the subangular pair; the intermediate pair of postero-lateral spines are very long and strong, a little longer than the inner pair and both pairs with about five or six fine spines along a good part of their inner margin; the proximal third pair of the postero-lateral spines are rather small.

The specimen is 2.8 mm. long; it is somewhat poorly preserved so that I may have committed some inaccuracy in the appendages on fig. 6a.— The specimen is from Sta. 4611, October 18, 1904, Surface.

Last Furcilia-Stage (fig. 6d).— The triangle formed by the frontal plate and rostrum in the main as in the preceding stage, but the lateral margins are nearly straight; the dorsal keel of the carapace is placed a little more forwards but still considerably behind the middle.— Eyes a little more developed.— Antennulae with the process from first peduncular joint a little shorter and the still undivided lower flagellum conspicuously longer than in the former stage.— Endopods of first and second pairs of thoracic legs more than half developed, with the full number of joints, and the relative size, shape, and tegumental

surface with setae of the two distal joints of second pair in the main as in fully developed specimens; third pair of legs almost rudimentary; branchiae rudimentary.

The three anterior pairs of pleopods with the endopod very small though terminating in a seta and the exopods well developed; the two posterior pairs are smaller, with the exopod setiferous while the endopod is rudimentary, without any seta.— Telson more slender than in the preceding stage; its terminal part between the inner postero-lateral spines considerably produced, the terminal margin transverse but shorter and with only five spines proportionately smaller than in the preceding stage; the inner pair of postero-lateral spines with the proximal half a little broader than in the preceding stage and considerably broader than the intermediate pair, which are more slender than in preceding stage.

Length of the specimen described 3 mm.— It was taken at Sta. 4588, October 12, 1904, Surface.

Remarks.— The shape and setae of the two distal joints of the second elongate pair of legs prove beyond doubt that the last-named specimen belongs to *Stylocheiron carinatum* G. O. S. And a comparison between this specimen and the specimen in the intermediate Furcilia-stage gives the result, that both belong to the same species. And as nothing was known on the larval stages of any species of the aberrant genus Stylocheiron I find it useful to give here what I can, though the younger specimen is not well preserved. The larvae of *S. carinatum* differ from those of Nyctiphanes, Thysanopoda, Euphausia, Pseudeuphausia, and Nematoscelis by having no denticle on the lower margin of the carapace; I think that this feature affords a good generic character; yet it may be very possible that the hitherto unknown larvae of the genus Nematobrachion agree with Stylocheiron in possessing no marginal denticles. The larvae of Stylocheiron agree, as might be expected, with those of Nematoscelis (and probably of Thysanoëssa) in having the two distal peduncular joints of the antennulae more slender than in those of the other genera mentioned, but they differ from the larvae of Nematoscelis by the shape of the frontal plate and by having the dorsal keel of the carapace smaller and remarkably far behind the middle. But judging from the two above-described larval stages of *S. carinatum* the development and structure of the larvae of the genus Stylocheiron seems to deviate but little from other genera of the order.

THE DISTRIBUTION OF THE EUPHAUSIACEA.

As already stated, the Agassiz Expedition 1904–1905 in the tropical and subtropical East Pacific secured thirty-nine species of the order Euphausiacea, thus a little more than half of the species known from all Oceans together. Among these thirty-nine species nineteen are at present known both from the Atlantic and from the Indian Ocean, eight from the Atlantic, but not from the Indian Ocean, five from the Indian Ocean (in the main from the Indian Archipelago) but not from the Atlantic; thus thirty-two of the thirty-nine of the species enumerated here from the East Pacific are known from at least one of the two other great Oceans. And I think that in no other order of Invertebrates 82 p. c. of the species known from the warm area of the East Pacific are also known either from one of the two other Oceans or from both! Seven species remain; among these one, viz. *Euphausia gibba* G. O. S., is also known from the West Pacific (between Api and Cape York), and a second, *E. pacifica* H. J. H. is widely distributed in the North Pacific and has been taken several times near Japan and Corea. Deducting these forms the following five species:— *Nyctiphanes simplex* H. J. H., *Euphausia eximia* H. J. H., *E. distinguenda* H. J. H., *E. lamelligera* H. J. H., and *E. mucronata* G. O. S. are known only from the East Pacific, but one among them *E. mucronata* has also been captured off Chile, thus more southwards, and a second, *Nyctiphanes simplex*, is known from the Gulf of California and another location at Lat. $35\frac{1}{2}^{\circ}$ N. Three species remain hitherto not known to me from any Station outside the area explored in 1904–1905!

As to the distribution within the area explored in 1904–1905 of the species taken at numerous localities I do not venture to say a great deal; an investigation of this kind must be connected with a detailed study of currents and temperatures. For the majority of the species in question I have in the passage on distribution pointed out the limits of the occurrence within the area explored, but I do not venture to attempt a more general treatment. Only one interesting detail I may call attention to. When two closely allied species, as *Euphausia diomedeae* Ortm. and *E. mutica* H. J. H., *Nematoscelis microps* G. O. S. and *N. gracilis* H. J. H., were both taken at numerous Stations, they were only taken together at some few Stations, and in one part of the area one of such two allied species was very common but quite wanting in another part, while the second species, which was absent in the first part, was common in the other.

Our knowledge of the bathymetrical occurrence and distribution is rather

imperfect, but some points may be mentioned. No species is a surface form to any degree comparable with *Siriella thompsonii* M. Edw. or *S. gracilis* Dana (comp. the statements on p. 193 and p. 194). The great majority of the species were taken only in "300 fms. to surface," but the material in the Copenhagen Museum proves that three such species, viz. *Thysanopoda tricuspidata* M. Edw., *T. aequalis* H. J. H., and *Euphausia pseudogibba* Ortm. have not infrequently been taken at the surface. The lists of Stations from the Agassiz Expedition together with the Copenhagen material shows that *Euphausia tenera* H. J. H., *E. lamelligera* H. J. H., the members of the *krohnii*-group, viz. *Euphausia eximia* H. J. H., *E. diomedeae* Ortm., *E. mutica* H. J. H., *E. brevis* H. J. H., (and *E. recurva* H. J. H.), and *Stylocheiron carinatum* G. O. S., were frequently taken at the surface. The Agassiz Stations show that full-grown specimens of *Nematoscelis gracilis* H. J. H. were never taken at the surface and generally in "300 fms. to surface," but that immature or generally even small specimens were taken at the surface at a few Stations. With the above-named exceptions the species of the genera Thysanopoda, Nematoscelis, Nematobrachion, and Stylocheiron have very rarely or never been taken at the surface. Specimens of *Bentheuphausia amblyops* G. O. S. have been captured at seven Stations in "300 fms. to surface," but all specimens with a single exception seem to be immature, and judging from the Monaco material the adults live generally in greater depths. Finally the adults of the two gigantic species *Thysanopoda cornuta* Illig. and *T. egregia* probably live always in great depths, and adult males of *T. monacantha* Ortm. are probably unknown; though Dr. Agassiz secured specimens of the last-named species at eighteen Stations in "300 fms. to surface" the males at hand seem to be immature.

It may still be mentioned that specimens of two species, *Euphausia distinguenda* H. J. H. and *Nematoscelis gracilis* H. J. H., were found in the bottom of the Tanner net from 300 fms. Of the first-named species both adult and especially immature or small specimens were also taken at the surface, while of *N. gracilis* only young specimens were taken a few times at the surface, numerous adult specimens from many Stations generally in "300 fms. to surface."

Pseudeuphausia latifrons G. O. S., which was taken at the Fiji Islands but not in 1904–5, may be mentioned separately. According to our knowledge, especially from the "Siboga," this species seems to live rather near the coasts, frequently in shallow water, and has, for instance, been captured at a number of anchorages.

EXPLANATION OF THE PLATES.

PLATE 1.

PLATE 1.

Fig. 1. **Chalaraspis alata** Willemoës-Suhm.

Fig. 1a. Anterior part of the body of an adult male from Sta. 4719, from above; × $\frac{16}{3}$.

Fig. 1b. Anterior part of the body of the same male, from the left side; × $\frac{11}{2}$. o. eye.

Fig. 1c. Right antennal squama of an immature specimen from Sta. 4672, from above; × 13.

Fig. 1d. Left mandible of the same immature specimen, from below; × $\frac{17}{2}$.

Fig. 1e. Left maxillula of the same immature specimen, from below; × $\frac{17}{2}$. 1. first joint; l^1. lobe from first joint; 2. second joint; 3. third joint.

Fig. 1f. Left maxilla of the same immature specimen, from below; × 17. 1. first joint; l^2. lobe from second joint; l^3. lobe from third joint; p. palp.

Fig. 1g. Left maxilliped of the same immature specimen, from below; × 13. The epipod omitted.

Fig. 1h. First left thoracic leg (the appendage behind the gnathopods) of the same immature specimen, from behind; × $\frac{17}{2}$.

Fig. 1i. Last (sixth) left thoracic leg of the same specimen, from behind; × $\frac{17}{2}$.

Fig. 1k. Posterior half of abdomen, with the distal parts of the uropods and telson omitted, of the adult male from Sta. 4719, from the left side; × $\frac{17}{3}$.

Fig. 1l. Fifth and sixth abdominal segments with telson and the right uropod of the same adult male, from above, × $\frac{16}{3}$.

Fig. 2. **Boreomysis media,** sp. nov.

Fig. 2a. Anterior part of an adult female from Sta. 4652, from above; 12.

Fig. 2b. Telson and left uropod of the same specimen, from above; × 16. a. a portion of the right lateral margin of the telson more highly magnified, viz. × 64, in order to show the arrangement and relative size of the lateral spines.

Fig. 3. **Boreomysis fragilis,** sp. nov.

Fig. 3a. Anterior part of a male from Sta. 4679, from above; × 16.

1. *Chalaraspis alata* Will.-Suhm. 2. *Boreomysis media* n. sp. 3. *B. fragilis* n. sp.

H. J. Hansen del. T. N. Möller sc.

PLATE 2.

PLATE 2.

Fig. 1. **Boreomysis fragilis,** sp. nov.

Fig. 1a. Telson and left uropod of the same male, from above; × 22.

Fig. 2. **Hemisiriella abbreviata,** sp. nov.

Fig. 2a. Anterior part of an adult female, from above; × 33.

Fig. 2b. Posterior part of sixth abdominal segment with left uropod and telson of the same female, from above; × 33.

Fig. 2c. Telson of the same specimen, from above; × 51.

Fig. 3. **Gastrosaccus pacificus,** sp. nov.

Fig. 3a. Anterior part of an adult female, from above, × 34.

Fig. 3b. First right pleopod of an adult male, from behind; × 45.

Fig. 3c. Second right pleopod of the same male, from behind; × 45.

Fig. 3d. Third right pleopod of the same male, from behind; × 45. The distal part of the exopod wanting.

Fig. 3e. Fourth right pleopod of the same male, from behind; × 45.

Fig. 3f. Fifth right pleopod of the same male, from behind; × 45.

Fig. 3g. Telson and right uropod of an adult female, from above; × 46.

Fig. 4. **Anchialina obtusifrons,** sp. nov.

Fig. 4a. Anterior part of an adult male, from above; × 20.

Fig. 4b. Left gnathopod of the same male, from behind; × 33.

Fig. 4c. Distal part of the exopod of third right male pleopod, from in front; × 186. a. the lamellar process; b. joint bearing the terminal processes; c. outer very long process, with its secondary branch c^1.; d. median ramified terminal process; e. inner terminal process.

Fig. 5. **Euchaetomera typica** G. O. Sars.

Fig. 5a. Median and left part of the anterior margin of the carapace of an ovigerous female, from above; × 48.

Fig. 5b. Right eye of the same female, from above; × 52.

Fig. 5c. Proximal part of right antenna with the squama of the same female, from above; × 23.

Fig. 5d. Distal part of fourth left leg of the same female, from in front; × 35.

Fig. 5e. End of sixth abdominal segment with telson and left uropod of the same female, from above; × 22.

1 Boreomysis fragilis n.sp. 2. Hemisiriella abbreviata n.sp. 3. Gastrosaccus pacificus n.sp.
4. Anchialina obtusifrons n.sp. 5. Euchaetomera typica G.O.S.

del. T.H. Möller sc.

PLATE 3.

PLATE 3.

Fig. 1. **Euchaetomera plebeja,** sp. nov.

Fig. 1a. Anterior part of a male from Sta. 4676, from above; × 33.
Fig. 1b. End of sixth abdominal segment with telson and left uropod of the same specimen, from above; × 25.

Fig. 2. **Cryptomysis lamellicauda,** gen. et. sp. nov.

Fig. 2a. Anterior part of an adult female, from above; × 32. The specimen is somewhat shrivelled.
Fig. 2b. Left antenna of the same female, from above; × 40.
Fig. 2c. Left mandible of the same female, from below; × 47.
Fig. 2d. Distal part of the same mandible, from below; × 48.
Fig. 2e. Second joint of the palp of the same mandible, from below; × 78.
Fig. 2f. Left maxillula of the same female, from below; × 80.
Fig. 2g. Left maxilla of the same female, from below; × 80.
Fig. 2h. Left maxilliped of the same female, from below; × 45.
Fig. 2i. Left gnathopod of the same female, from below; × 45.
Fig. 2k. Major distal part of the endopod of a thoracic leg of the same specimen; × 45.
Fig. 2l. End of sixth abdominal segment with telson and left uropod of the same specimen, from above; × 32.
Fig. 2m. Telson shown in the preceding figure, from above; × 74.

Fig. 3. **Doxomysis pelagica,** gen. et. sp. nov.

Fig. 3a. Left antenna of the adult female, from below; × 40.
Fig. 3b. Left mandible of the same female, from below; × 56.
Fig. 3c. Distal part of the same mandible, from below; × 88.
Fig. 3d. Left maxilla of the same female, from below; × 90.
Fig. 3e. Left maxilliped of the same female, from below; × 88. Exopod and epipod omitted.
Fig. 3f. Telson of the same female, from above; × 47.
Fig. 3g. Distal part of telson, from above; × 80.

Fig. 4. **Thysanopoda cristata** G. O. Sars.

Fig. 4a. Carapace of an immature specimen from Sta. 4736, from the left side; × $1\frac{5}{2}$. A denticle at the lateral margin omitted.
Fig. 4b. Front part of the carapace of an adult male, from above; × 5.
Fig. 4c. Front part of the carapace of the adult male, from the left side; × 8.

1. Euchaetomera plebeja n. sp. 2. Cryptomysis lamellicauda n.gen.n.sp. 3 Doxomysis pelagica n.gen.n.sp.
4. Thysanopoda cristata G.O.S.

H.J.Hansen del. F.V.Møller sc.

PLATE 4.

PLATE 4.

Fig. 1. **Thysanopoda cristata** G. O. Sars.

Fig. 1a. Left antennular peduncle of the adult male, from the outer side; × 8.

Fig. 1b. Right antennular peduncle of the adult male, from above; × 8.

Fig. 1c. Left antennular peduncle of the young specimen from Sta. 4699, from the left side; × 14.

Fig. 1d. Left maxillula of the immature specimen from Sta. 4736, from below; × 31.

Fig. 1e. Male copulatory organ of left first pleopod, unrolled and seen from behind; × 25. li. inner lobe; lm. median lobe; ls. setiferous lobe — the setae along both margins omitted; lu. auxiliary lobe; p^1. spine-shaped process; p^2. terminal process; p^3. proximal process; p^4. lateral process.

Fig. 1f. Terminal process of the organ shown in fig. 1e, from behind; × 45.

Fig. 1g. Terminal process of the organ shown in fig. 1e, from the inner side; × 50.

Fig. 1h. Distal part of the median lobe of the organ shown in fig. 1e, seen from in front and exhibiting the lateral process and the additional process; × 45.

Fig. 2. **Thysanopoda tricuspidata** H. Milne Edwards.

Fig. 2a. Left maxillula of an adult specimen, from below; × 32. 1. first joint; 1^1. lobe from first joint; 2. second joint; 3. third joint; 3^1. lobe from third joint; 4. fourth joint or palp; px. pseudexopod.

Fig. 3. **Thysanopoda monacantha** Ortmann.

Fig. 3a. Left maxillula of a probably immature male, from below; × 34. The lettering as in fig. 2a.

Fig. 3b. Inner and median lobes of left copulatory organ of a probably immature male, from behind; × 85. The median lobe has the lateral process and only one additional process.

Fig. 3c. Inner and median lobes of left copulatory organ of another probably immature male, from behind; × 85. p^4. lateral process; p^5. three additional processes.

Fig. 4. **Thysanopoda aequalis** H. J. Hansen.

Fig. 4a. Left maxillula of an adult female, from behind; × 35.

Fig. 5. **Thysanopoda obtusifrons** G. O. Sars.

Fig. 5a. Anterior part of the body of a female, from above; × 15. The setae on left antennula omitted.

Fig. 5b. Anterior part of a female, from the left side; × 14.

Fig. 5c. Left maxillula of an adult male, from below; × 30.

Fig. 5d. Left copulatory organ, unrolled and seen from behind; × 48. p^4. lateral process; p^5. additional process.

Fig. 5e. Inner and median lobes of left copulatory organ, from the inner side; × 60. p^1. spine-shaped process; p^2. terminal process; p^3. proximal process; p^4. lateral process; p^5. additional process; lu. margin of the auxiliary lobe with its minute coupling hooks.

Fig. 5f. Distal part of the proximal process of the organ shown in fig. 5e, from the inner side; × 130.

1. Thysanopoda cristata G.O.S. 2. T. tricuspidata M.Edw. 3. T. monacantha Ortm.
4. T. aequalis H.J.H. 5. T. obtusifrons G.O.S.

H.J.Hansen del. T.N. Möller sc.

PLATE 5.

PLATE 5.

Fig. 1. **Thysanopoda pectinata** Ortmann.

Fig. 1a. Anterior part of a female from Sta. 4719, from above; × 13. The setae on right antennula omitted.

Fig. 1b. Anterior part of a female from Sta. 4705, from the left side; × 12.

Fig. 1c. Front end of the carapace of a male from Sta. 4705, from above; × 12.

Fig. 1d. Left maxillula of a male, from below; × 24. 4. fourth joint or palp, very small and seen through the large pseudexopod.

Fig. 1e. Left copulatory organ, unrolled and seen from behind; × 34. p^1. spine-shaped process; p^2. terminal process; p^3. proximal process; p^4. lateral process; p^5. additional process; p^6. secondary additional process.

Fig. 1f. Distal part of the inner and median lobes of left copulatory organ, seen from the inner side and showing all processes excepting the secondary additional process; × 48.

Fig. 1g. Distal part of the proximal process, seen from the outer side; × 50.

Fig. 1h. The additional process, seen from in front; × 90.

Fig. 1i. Inner lobe with its three processes of left copulatory organ of a small male from Sta. 4705, from behind; × 68.

Fig. 1k. Anterior part of a young specimen, 11 mm. long, from Sta. 4730, from above; × 23. Setae omitted.

Fig. 1l. Anterior part of the young specimen shown in the preceding figure and seen from the right; × 14.

Fig. 1m. Right antennula of the same young specimen, from the right side; × 25.

Fig. 2. **Thysanopoda orientalis** H. J. Hansen.

Fig. 2a. Left maxillula of an adult male, from below; × 32. The palp is seen through the large pseudexopod.

Fig. 2b. Outline of left maxillula of another male, from below; × 20. The figure is given for comparison with fig. 2a in order to show difference in the palp.

Fig. 2c. Left maxilla of an adult male, from below; × 20. 1. first joint; 2. second joint; l^2. lobe from second joint; 3. third joint; l^3. lobe of third joint; ex. exopod.

Fig. 2d. Left copulatory organ, unrolled and seen from behind; × 33. p^4. lateral process; p^5. additional process; p^6. secondary additional process.

Fig. 2e. Terminal process of the same organ, from in front; × 53.

Fig. 2f. Distal part of the proximal process of the same organ, from behind; × 86.

Fig. 2g. Distal part of the proximal process of the same organ, from in front; × 127.

Fig. 2h. Distal part of the proximal process of left organ of another specimen, from behind; × 86.

Fig. 2i. Distal half of the median lobe of the organ shown in fig. 2d, seen from the inner side; × 50. The lettering as in fig. 2d.

1. Thysanopoda pectinata Ortm. 2. T. orientalis H.H.

H.J.Hansen del.

T.N.Müller sc.

PLATE 6.

PLATE 6.

Fig. 1. (?) **Thysanopoda cornuta** Illig. Young.

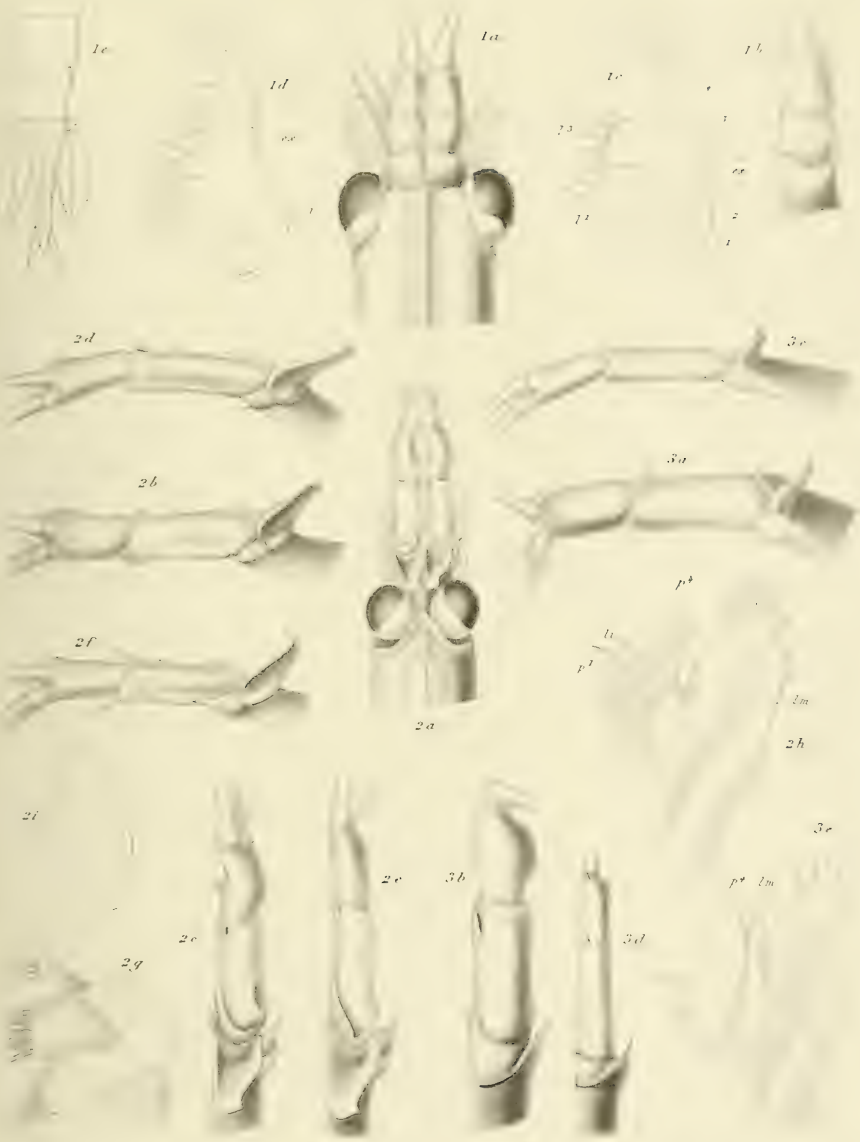
Fig. 1a. Anterior part of the single young specimen, 14.5 mm. long, from above; × 15.
Fig. 1b. Peduncle of right antennula, from above; × 31.
Fig. 1c. Left maxillula, from below; × 34. 1. first joint; l^1. lobe from first joint; 2. second joint; 3. third joint; l^2. lobe of third joint; 4. fourth joint or palp; ex. exopod.
Fig. 1d. Left maxilla, from below; × 34. 1. first joint; ex. exopod.
Fig. 1e. Posterior part of abdomen, from above; × $\frac{19}{2}$.

Fig. 2. **Nyctiphanes simplex** H. J. Hansen.

Fig. 2a. Anterior part of an adult male, from above; × 16.
Fig. 2b. Left antennula of a male, from the outer side; × 27.
Fig. 2c. Right antennula of a male, from above; × 26.
Fig. 2d. Left antennula of an adult female, from the outer side; × 28.
Fig. 2e. Right antennula of an adult female, from above; × 27.
Fig. 2f. Left antennula of an immature specimen, from the outer side; × 28.
Fig. 2g. Left maxillula of a female, from below; × 58.
Fig. 2h. Left copulatory organ, unrolled and seen from behind; × 80. li. inner lobe; lm. median lobe; p^1. spine-shaped process; p^4. lateral process.
Fig. 2i. Major distal part of the inner lobe of the same organ, from behind; × 143.

Fig. 3. **Nyctiphanes australis** G. O. Sars.

Fig. 3a. Left antennula of the adult male, from the outer side; × 22.
Fig. 3b. Right antennula of the same male, from above; × 22.
Fig. 3c. Left antennula of the adult female, from the outer side; × 27.
Fig. 3d. Right antennula of the same female, from above; × 24.
Fig. 3e. Left copulatory organ, unrolled and seen from behind; × 58. lm. median lobe; p^4. lateral process.



1. Thysanopoda cornuta Illig (Young). *2. Nyctiphanes simplex* H.M.

3. N. australis G.O.S.

H.J.Hansen del. F.N.Möller sc.

PLATE 7.

PLATE 7.

Fig. 1. **Nyctiphanes simplex** H. J. HANSEN. Young.

Fig. 1a. Anterior part of a young specimen measuring 7 mm. in length, from above; × 33. The setae of left antennula omitted.

Fig. 1b. Left antennula of the specimen shown in the preceding figure, from the outer side; × 48.

Fig. 2. **Euphausia eximia** H. J. HANSEN.

Fig. 2a. Anterior part of the body of an adult male, from above; × 14. The setae on left antennula omitted.

Fig. 2b. Peduncle of left antennula of an adult male, from the outer side; × 25.

Fig. 2c. Major part of the peduncle of right antennula of a male, from above; × 25.

Fig. 2d. Distal part of second joint of the peduncle of right antennula of another specimen, a female, from above; × 27.

Fig. 2e. Left copulatory organ, unrolled and seen from behind; × 47. p^3. terminal process; p^3. proximal process; p^4. lateral process.

Fig. 2f. Inner lobe of left copulatory organ of another specimen, from the inner side; × 50. Lettering as in fig. 2e.

Fig. 2g. Median lobe of left copulatory organ of a large specimen, from the inner side; × 42. p^4. lateral process.

Fig. 3. **Euphausia recurva** H. J. HANSEN.

Fig. 3a. Anterior part of the body of an adult male, from above; × 23. The setae on left antennula omitted.

Fig. 3b. Left antennular peduncle of an adult male, from the left; × 39.

Fig. 3c. Major part of the peduncle of right antennula of an adult male, from above; × 36.

Fig. 3d. Left antennular peduncle of an adult female from Lat. 34° 50′ S., long. 25° 30′ E., from the outer side; × 25.

Fig. 3e. Major part of the peduncle of right antennula of the adult female from Lat. 34° 50′ S., long. 25° 30′ E., from above; × 22.

Fig. 3f. Left copulatory organ, unrolled and seen from behind; × 77.

Fig. 3g. Distal part of the terminal process of the organ shown in fig. 3f, from behind; × 140.

Fig. 3h. Terminal process of left organ of another male, from the inner side; × 130.

Fig. 3i. Terminal part of the proximal process of the organ shown in fig. 3f, from behind; × 150.

Fig. 3k. Terminal part of the proximal process of the left organ of another male from Sta. 4576, from behind; × 150.

Fig. 3l. Proximal process of left copulatory organ of a male from Lat. 34° 50′ S., long. 25° 30′ E., from behind; × 80.

Fig. 3m. Terminal part of the proximal process shown in fig. 3l, from behind; × 150.

Fig. 3n. Terminal part of the proximal process of left copulatory organ of another male from Lat. 34° 50′ S., long. 25° 30′ E., from behind; × 150.

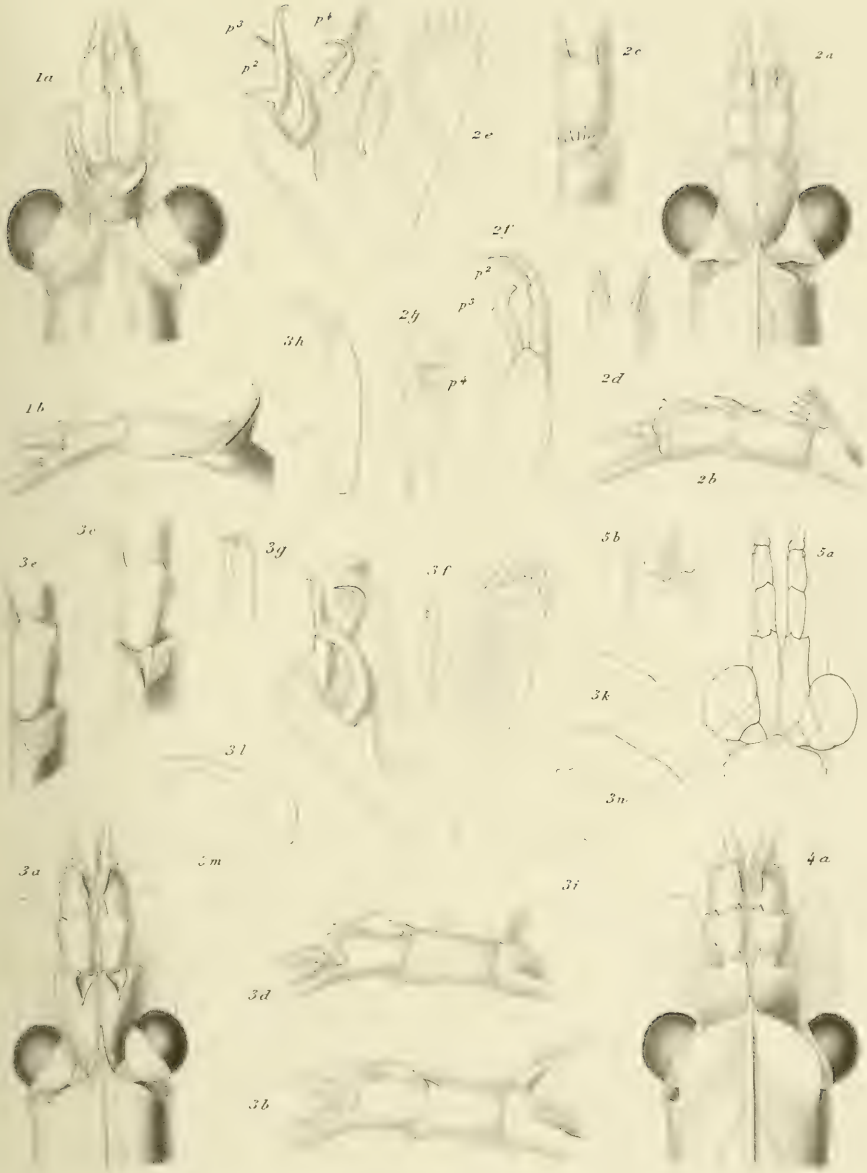
Fig. 4. **Euphausia diomedeae** ORTMANN.

Fig. 4a. Anterior part of the body of a male from Sta. 4721, having the rostral plate strongly expanded and the rostrum short; from above; × 15.

Fig. 5. **Euphausia pacifica** H. J. HANSEN.

Fig. 5a. Anterior part of a slightly more than half-grown specimen, from above; × 19.

Fig. 5b. Terminal part of the proximal joint with the basal part of second joint of right antennular peduncle of the specimen shown in fig. 5a, from above; × 50.



1. *Nyctiphanes simplex* H.J.H. (Young). 2. *Euphausia eximia* H.J.H.
3. *E. recurva* H.J.H. 4. *E. diomedeæ* Ortm. 5. *E. pacifica* H.J.H.

H.J. Hansen del. T.N. Möller sc.

PLATE 8.

PLATE 8.

Fig. 1. **Euphausia brevis** H. J. Hansen.

Fig. 1a. Anterior part of the body of a male, from above; × 32.

Fig. 1b. Left antennular peduncle of a male, from the outer side; × 47.

Fig. 1c. Major part of right antennular peduncle of a male, showing the terminal part of first joint with its lobe, and the whole second joint, from above; × 47.

Fig. 1d. Left copulatory organ, unrolled and seen from behind; × 87.

Fig. 1e. Proximal process of the organ shown in the preceding figure, from behind; × 150.

Fig. 1f. Inner lobe of left copulatory organ of another male, seen from the inner side; × 141.

Fig. 1g. Distal part of the terminal process of the lobe exhibited in fig. 1f, seen from the inner side and a little from in front; × 141.

Fig. 2. **Euphausia gibba** G. O. Sars.

Fig. 2a. Left antennular peduncle of a male, from the outer side; × 25.

Fig. 2b. Left copulatory organ, unrolled and seen from behind; × 52. p^2. terminal process; p^3. proximal process; p^4. lateral process; lm. median lobe, with its finger-like distal part.

Fig. 3. **Euphausia distinguenda** H. J. Hansen.

Fig. 3a. Anterior part of the body of a male, from above; × 20. The setae on left antennula omitted.

Fig. 3b. Anterior part of the body of a male, from the left side; × 17.

Fig. 3c. Left antennular peduncle of the same male, from the left side; × 35. p. ear-like process at the distal outer upper angle of second joint.

Fig. 3d. Major part of right antennular peduncle of a male, showing the distal part of first joint and the whole second joint, from above; × 35. p. ear-like process at the distal outer upper angle of second joint.

Fig. 3e. Left copulatory organ, unrolled and seen from behind; × 77.

Fig. 3f. Proximal process, p^3., and median lobe with the lateral process; p^4., of left copulatory organ of another specimen, seen from the inner side; × 90.

Fig. 4. **Euphausia lamelligera** H. J. Hansen.

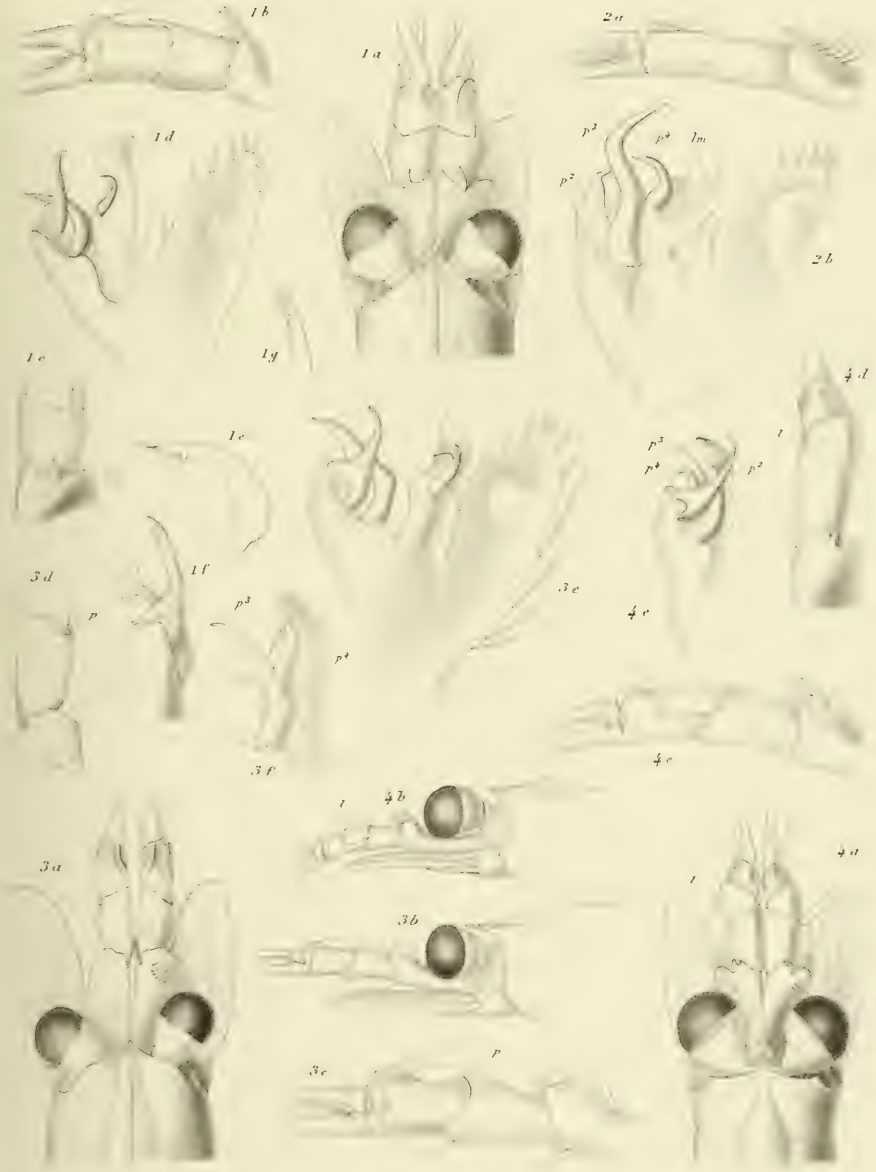
Fig. 4a. Anterior part of the body of a male, from above; × 23. l. movable lamella from second joint.

Fig. 4b. Anterior part of the body of a male, from the left side; × 18.

Fig. 4c. Left antennular peduncle of a male, from the outer side; × 38.

Fig. 4d. Right antennular peduncle of a male, from above; × 36. l. movable lamella from the end of second joint. The setae omitted.

Fig. 4e. Inner and median lobes of left copulatory organ, seen from the inner side; × 84. p^2. terminal process; p^3. proximal process; p^4. lateral process.



1 Euphausia brevis H.J.H. *2. E. gibba* G.O.S. *3. E. distinguenda* H.J.H.
4. E. lamelligera H.J.H.

H.J.Hansen del

T.N.Möller sc.

PLATE 9.

PLATE 9.

Fig. 1. **Euphausia lamelligera** H. J. Hansen.

Fig. 1a. Left copulatory organ, unrolled and seen from behind; × 84.

Fig. 2. **Euphausia gibboides** Ortmann.

Fig. 2a. Anterior part of the body of a male, from above; × 12. The setae on left antennular peduncle omitted.

Fig. 2b. Anterior part of the body of a male, from the left side; × 10. Setae on the antennula omitted.

Fig. 2c. Left antennular peduncle of same male, from the outer side; × 21.

Fig. 2d. Right antennular peduncle, excepting the major part of third joint, of a male, from above; × 20.

Fig. 2e. Left copulatory organ, unrolled and seen from behind; × 34. a. protruding, triangular, acute tubercle from the median lobe; p^2. terminal process; p^3. proximal process; p^4. lateral process.

Fig. 2f. Distal part of the proximal process of the same organ, from behind; × 95.

Fig. 2g. Left copulatory organ almost in the natural position of another male, from the inner side; × 34. Lettering as in fig. 2e.

Fig. 2h. Distal part of the proximal process of the organ shown in fig. 2g, from the inner side; ×95.

Fig. 3. **Euphausia mucronata** G. O. Sars.

Fig. 3a. Anterior part of the body of a male, from above; × 13. The setae on left antennula omitted.

Fig. 3b. Anterior part of the body of a male, from the left side; × $\frac{23}{2}$. Setae on the left antennula omitted. The frontal plate too obtuse.

Fig. 3c. Left antennular peduncle of the specimen shown in fig. 3b, from the outer side; × 23.

Fig. 3d. Right antennular peduncle of a male, from above; × 22. Most of the setae omitted.

Fig. 3e. Left copulatory organ, unrolled and seen from behind; × 46. p^2. terminal process; p^3. proximal process; p^4. lateral process; p^5. additional process.

Fig. 3f. Proximal process of the organ shown in fig. 3e, from behind; × 80.

Fig. 3g. Inner and median lobes of left organ of another male, seen from the inner side; × 57. Lettering as in fig. 3e.

Fig. 4. **Nematoscelis microps** G. O. Sars.

Fig. 4a. Anterior part of an adult male, from above; × 9.

Fig. 4b. Anterior part of an immature male, from above; × 9.

Fig. 4c. Anterior part of an adult female, from above; × 9.

Fig. 4d. Anterior part — the majority of the antennular peduncles omitted — of another adult female in order to show the anomalous rostrum, from above; × 9.

1. *Euphausia lamelligera* H.H. 2. *E. gibboides* Ortm. 3. *E. mucronata* G.O.S.
4. *Nematoscelis microps* G.O.S.

PLATE 10.

PLATE 10.

Fig. 1. **Nematoscelis microps** G. O. Sars.

Fig. 1a. Left maxilla of a female, from below; × 33. All setae omitted.
Fig. 1b. Inner and median lobes of left copulatory organ of an immature male, from behind; × 83.

Fig. 2. **Nematoscelis gracilis** H. J. Hansen.

Fig. 2a. Left maxilla of a female, from below; × 33. All setae omitted.

Fig. 3. **Nematoscelis tenella** G. O. Sars.

Fig. 3a. Left maxillula of a female, from below; × 40.
Fig. 3b. The distal nearly spiniform seta from the end of the palp of the maxillula shown in fig. 3a, from below; × 160.
Fig. 3c. Left maxilla of the same female, from below; × 40.

Fig. 4. **Nematobrachion boopis** Calman.

Fig. 4a. Left maxillula of a female, from below; × 26.
Fig. 4b. Left maxilla of the same female, from below; × 26.
Fig. 4c. The inner, the median and the auxiliary lobes of left copulatory organ, unrolled and seen from behind; × 44. p^1. spine-shaped process; p^2. terminal process; p^3. proximal process; p^4. lateral process; p^5. additional process.
Fig. 4d. The inner lobe of the same copulatory organ, seen from the outer side; × 80. The lettering as in fig. 4c.

Fig. 5. **Nematobrachion flexipes** (Ortmann).

Fig. 5a. Anterior part of the body of a male, from above; × 12. The setae on left antennula omitted.
Fig. 5b. Anterior part of the body of the same male, from the left side; × 10.
Fig. 5c. Left antennular peduncle of the same male, from the outer side; × 20.
Fig. 5d. Distal part of second peduncular joint, with the basal portion of third joint of left antennula of a female, from above; × 24.
Fig. 5e. Left maxillula of a female, from below; × 32.
Fig. 5f. Left maxilla of the same female, from below; × 32.
Fig. 5g. The abdominal segments of a female, from the left side; × $\frac{16}{3}$.
Fig. 5h. Left copulatory organ, unrolled and seen from behind; × 45.
Fig. 5i. The inner lobe with its three processes of left copulatory organ of another male, from behind; × 90.
Fig. 5k. The inner lobe shown in fig. 5i, seen from the outer side; × 90. The lettering as on fig. 4c and fig. 4d.
Fig. 5l. The distal portion of the proximal process of the lobe shown in fig. 5i, from behind; × 220.
Fig. 5m. The distal portion of the proximal process of left copulatory organ of a third male, seen as from the end of the inner lobe; × 220.

Fig. 6. **Nematobrachion sexspinosus** H. J. Hansen.

Fig. 6a. Left maxillula of a male, from below; × 25. pex. pseudexopod.

1. Nematoscelis microps G.O.S. *2. N. gracilis H.M.H.* *3. N. tenella G.O.S.*
4. Nematobrachion boopis Calm. *5. N. flexipes Ortm.* *6. N. sexspinosus H.M.H.*

H.J. Hansen del. T.N. Möller sc.

PLATE 11.

PLATE 11.

Fig. 1. **Nematobrachion sexspinosus** H. J. Hansen.

Fig. 1a. Anterior part of the body of a male, from the left side; × $\frac{15}{2}$.
Fig. 1b. Left antennular peduncle of the same male, from the outer side; × 13.
Fig. 1c. Distal part of second peduncular joint with the basal part of third joint of left antennula of the same male, from above; × 20.
Fig. 1d. Left maxilla of a male, from below; × 25.
Fig. 1e. The four posterior abdominal segments of a male, from the left side; × $\frac{9}{2}$.
Fig. 1f. Major part of the same segments as shown in fig. 1e, from above; × 7.
Fig. 1g. The inner, the median, and the auxiliary lobes of left copulatory organ, unrolled and seen from behind; × 40.
Fig. 1h. Inner lobe with its processes of the same copulatory organ, from behind; × 78.
Fig. 1i. Distal half of the terminal process of the same organ, seen from the outer side; × 80.

Fig. 2. **Stylocheiron carinatum** G. O. Sars.

Fig. 2a. Left maxillula of a female, from below; × 58.
Fig. 2b. Left maxilla of the same female, from below; × 58.

Fig. 3. **Stylocheiron suhmii** G. O. Sars.

Fig. 3a. Left eye with stalk of a male, seen with the light transmitted and the lower half somewhat diagrammatic, from the outer side; × 46.
Fig. 3b. Sixth abdominal segment of a male, from the outer side; × 46.

Fig. 4. **Stylocheiron longicorne** G. O. Sars.

Fig. 4a. Left maxillula of a female, from below; × 42.
Fig. 4b. Left maxilla of the same female, from below; × 42.

Fig. 5. **Stylocheiron abbreviatum** G. O. Sars.

Fig. 5a. Anterior part of an adult male (from Sta. 4734), from the left side; × scarcely 9. a^2. last peduncular joint of the endopod of the left antenna; l^2. second left thoracic leg — the distal half with the chela omitted; mxp. left maxilliped.
Fig. 5b. Third peduncular joint with both flagella of left antennula of the same male, from the outer side; × 15.
Fig. 5c. Third peduncular joint with the whole upper flagellum and the major part of the lower flagellum of the male left antennula shown in fig. a, from above; × 15.
Fig. 5d. Left maxillula of a female from below; × 38. s. the distal spine on the end of the palp more highly magnified, viz. × 128.
Fig. 5e. Left maxilla of the same female, from below; × 38.
Fig. 5f. The inner and the median lobes of left copulatory organ, unrolled and seen from behind; × 185. p^1. spine-shaped process; p^2. terminal process; p^3. proximal process; p^4. lateral process.

1. Nematobrachion sexspinosus H.J.H. *2. Stylocheiron carinatum* G.O.S.
3. S. Sukmii G.O.S. *4. S. longicorne* G.O.S. *5. S. abbreviatum* G.O.S.

H.J.Hansen del. T.N.Möller sc.

PLATE 12.

PLATE 12.

Larval Stages of Euphausiacea.

Fig. 1. **Thysanopoda** sp. (*T. monacantha* Ortmann. aff.).

Fig. 1a. First Furcilia-stage; length 3.7 mm. The animal, from the left; × 21. mxp. maxilliped.
Fig. 1b. Anterior part of the same larva, from above; × 37. Setae and antenna on the right side omitted.
Fig. 1c. Posterior part of abdomen with right uropod of the same larva, from above; × 30.
Fig. 1d. Posterior part of telson of the same larva, from above; × 80.
Fig. 1e. Last Furcilia-stage; length 5.0 mm. The animal, from the left side; × 21. mxp. maxilliped.
Fig. 1f. Anterior part of the specimen shown in fig. 1e, from above; × 28. The distal part of left antennula, right antenna, and most setae omitted.
Fig. 1g. Distal part of telson of the specimen shown in fig. 1e, from above; × 87.

Fig. 2. **Euphausia distinguenda** H. J. Hansen.

Fig. 2a. Anterior half of a larva in the last Furcilia-stage; from the left; × 35. The animal is 2.8 mm. long.
Fig. 2b. Anterior part of the same specimen, from above; × 49. The setae on right antennula omitted.
Fig. 2c. Distal part of telson of the same specimen, from above; × 82.

Fig. 3. **Nyctiphanes simplex** H. J. Hansen.

Fig. 3a. Cephalothorax and the three anterior abdominal segments of a larva in the intermediate Furcilia-stage, from the left; × 26. mxp. maxilliped. The animal is 3.2 mm. long.
Fig. 3b. Anterior part of the same specimen, from above; × 30.
Fig. 3c. Posterior part of abdomen of the same specimen, from above; × 30. Right uropod omitted.
Fig. 3d. Distal part of telson of the same specimen, from above; × 83.
Fig. 3e. Posterior part of abdomen with left uropod of a larva in last Furcilia-stage, from above; × 29. The animal is 3.7 mm. long.
Fig. 3f. Distal part of the telson shown in fig. 3c, from above; × 83.

Fig. 4. **Pseudeuphausia latifrons** G. O. Sars.

Fig. 4a. Anterior part of a larva in a Cyrtopia-stage, from above; × 32. The animal is 3.2 mm. long.
Fig. 4b. Posterior part of abdomen with right uropod of the same larva, from above; × 32.

Fig. 5. **Nematoscelis microps** G. O. Sars.

Fig. 5a. Larva in the first Cyrtopia-stage, from the right; × 25. The animal is 3.5 mm. long.
Fig. 5b. Head with eyes and antennulae of the same specimen, from above; × 39.
Fig. 5c. End of telson of the same specimen, from above; × 93.

Fig. 6. **Stylocheiron carinatum** G. O. Sars.

Fig. 6a. Larva in the intermediate Furcilia-stage, from the right; × 30. The animal is 2.8 mm. (On possible inaccuracies in the figure see page 293).
Fig. 6b. Head with eyes and antennulae of the same specimen, from above; × 46. The setae omitted.
Fig. 6c. Posterior part of telson of the same specimen, from above; × 140.
Fig. 6d. Cephalothorax and first abdominal segment of a larva in the last Furcilia-stage, from the right; × 30. The animal is 3 mm. long.

Larval Stages of Euphausiacea.

1. Thysanopoda sp. 2. Euphausia distinguenda. 3. Nyctiphanes simplex.
4. Pseudeuphausia latifrons. 5. Nematoscelis microps. 6. Stylocheiron carinatum.

H.J. Hansen del. T.N. Möller sc.

Memoirs of the Museum of Comparative Zoölogy
AT HARVARD COLLEGE.
Vol. XXXV. No. 5.

REPORTS ON THE SCIENTIFIC RESULTS OF THE EXPEDITION TO THE TROPICAL PACIFIC, IN CHARGE OF ALEXANDER AGASSIZ, BY THE U. S. FISH COMMISSION STEAMER "ALBATROSS," FROM AUGUST, 1899, TO JUNE, 1900, COMMANDER JEFFERSON F. MOSER, U. S. N., COMMANDING.

XIX.

THE DOLABELLINAE.

By F. M. MacFARLAND.

WITH TEN PLATES.

[Published by permission of H. M. Smith, U. S. Commissioner of Fish and Fisheries].

CAMBRIDGE, U. S. A.:
Printed for the Museum.
September, 1918.

TABLE OF CONTENTS.

	Page
Introduction	301
Systematic characters of the Opisthobranchiata	301
Tectibranchiata	301
Aplysoidea	301
Aplysiidae	302
Aplysiinae	302
Dolabriferinae	302
Dolabellinae	302
Dolabella Lamarck	303
D. scapula (Martyn)	304
D. ecaudata (Rang)	304
D. teremidi (Rang)	305
D. gigas (Rang)	305
D. hasseltii (Férussac)	305
D. hemprichii Ehrenberg	305
D. guayaquilensis Petit	305
D. elongata Sowerby	306
D. californica Stearns	306
D. neira Sowerby	306
Dolabella agassizi, sp. nov.	306
External characters	307
General form and color	307
Dimensions	307
Foot	308
Epipodia	308
Pallial complex	308
Shell	311
Internal anatomy	312
Alimentary tract	312
Pharyngeal bulb	312
Mandibles	313
Radula	316
Palatal folds	318
Palatal spines	319
Salivary glands	323
Oesophagus	323
Ingluvies and triturating stomach	323
Liver and intestine	325
Reproductive system	325
Ovotestis	326
Small hermaphroditic duct	326
Adnexed genital mass	326
Spermatocyst	327
Albumen and nidamental glands	327
Large hermaphroditic duct	327
Spermatotheca	328
External spermatic groove and penis	328
Nervous system	329
Central nervous system	329
Cerebral ganglia	330
Cerebral nerves	330
Pedal ganglia	333
Pedal nerves	334
Parapedal commissure	337
Pleural ganglia	338
Pleural nerves	338
Buccal ganglia	339
Buccal nerves	340
Parieto-visceral ganglia	341
Visceral nerves	342
Parietal nerves	344
Respiratory, circulatory, and excretory systems	344
Literature	346
Explanation of plates	

INTRODUCTION.

A single specimen of a species of Dolabella was collected at Easter Island by the Tropical Pacific Expedition on 21 December, 1899. An excellent water-color sketch of the animal while living was made by Mr. Agassiz, and it was preserved in alcohol, being later placed in my hands for further study. In view of the notable lack of detailed information upon the anatomy of this genus, I deem the opportunity a valuable one for such a study, and the present paper is offered as a contribution to that end. In addition to the single specimen from Easter Island some use has been made of other specimens of a different species, *Dolabella hasseltii* (Férussac), collected at Samoa and given to me by my friend, Sir Charles Eliot, Vice Chancellor of the University of Hong Kong, China.

SYSTEMATIC CHARACTERS OF THE OPISTHOBRANCHIATA.

Marine Euthyneura with aquatic respiration; the ventricle of the heart is generally anterior, and the pallial cavity, when present, is widely open. There is a marked tendency to a reduction of the shell, which may become internal or disappear. In the naked forms spicules are sometimes developed.

Tectibranchiata.

Hermaphroditic opisthobranchiate Mollusca provided in the adult state with a mantle and shell, with certain exceptions; with one branchial plume and osphradium, with certain exceptions.

Aplysoidea.

Shell much reduced, more or less internal, or lost altogether in the adult state. Head with two pairs of tentacles. Margins of the parapodia separate from the ventral surface of the foot, and generally modified into natatory lobes.

Visceral commissure usually very much shortened, except in Tethys and Dolabella. Genital duct monaulic, the hermaphroditic duct connected with the penis by a ciliated groove.

Aplysiidae.

Animal lengthened, not protected by a shell, the neck and head narrower than the body; mouth a vertical fissure; anterior angles of the head produced into two tentacular lobes folded above; behind them the cylindrical or conical rhinophores, slit above, in front of which are the minute eyes. Parapodia recurved over the back, forming two lateral or dorsal lobes enclosing the mantle and ctenidium. Genital orifice between the dorsal lobes, communicating by a long furrow with the evertible penis, which is near the anterior right tentacle. Shell nearly or entirely covered by the mantle, uncoiled, in the form of a concave plate, or absent. Mouth with corneous jaws and a large multiserial radula composed of similar teeth; stomach armed with horny nodules; anus behind the branchial plume.

Aplysiinae.

Parapodial lobes well developed, their anterior ends separated; genital orifice in front of the ctenidium; radula with wide denticulate rhachidian teeth, and narrower serrate and denticulate laterals. Shell flexible.

Dolabriferinae.

Parapodia considerably united behind, in front contiguous, separated only by the spermatic furrow; genital orifice in front of the ctenidium; shell calcareous or absent; radula with well-developed rhachidian teeth, larger than the laterals.

Dolabellinae.

Parapodia scarcely mobile, united behind, inclosing a large branchial chamber, their anterior ends contiguous, separated by the spermatic furrow; the dorsal slit short. Posterior part of body obliquely truncate, bounded by a ridge; Genital orifice usually under the posterior part of the ctenidium; radula with the rhachidian tooth rudimentary or nearly so, laterals very numerous with long simple cusps; shell well developed, calcareous.

DOLABELLA LAMARCK, 1801.

Dolabella LAMARCK, Système anim. sans vertèbres, 1801, p. 62.
Aplysia (in part) RANG, Hist. nat. aplysiens, 1828, p. 36.
Dolabella PILSBRY, Tryon's Manual conch., 1896, **16**, p. 150.

General body-form conic, wide and obliquely truncate behind, narrower in front. Integument more or less warty. Head bearing in front a pair of subcylindrical buccal tentacles, slit above; rhinophores much nearer the anterior margin than to the dorsal slit, similar to those of Tethys. Eyes minute, in front of the rhinophores; posterior area of the body defined by an obliquely transverse ridge. Parapodial lobes united save for a dorsal slit, more open at the ends, the anterior insertions of the lobes contiguous, parted only by the spermatic groove. Mantle not nearly covering the ctenidium, produced in a folded siphon behind. Branchial cavity very large. Genital orifice usually under the posterior portion of the ctenidium, penis very long, near right buccal tentacle. Hypobranchial gland multiple.

Shell solid and calcareous, hatchet shaped, loosely coiled, the free spire obliquely decurved, heavily calloused; sinus deep and concave; margins reflexed.

TYPE:— *Dolabella scapula* (Martyn, 1786).

The earliest record of this form is found in D'Amboinsche Rariteitkamer and in the Thesaurus imaginum Piscium Testaceorum, of Georg Eberhard Rumpf, printed in Amsterdam, the first named in 1705, and the second in 1711, the same plates being used in each. Figure 5 of Plate **10** represents the animal designated as "*limax marina tertia*," while fig. 12 of Plate **40** reproduces the shell, which is termed "*tertia species operculi callorum*." That the shell so figured belonged to the animal shown on Plate **10**, was not positively known until the dissections made by Cuvier (1804) of specimens collected by Péron at Mauritius, confirmed the statement of the latter as to the identity of the two forms. The same shell was figured by Martyn in the Universal conchologist in 1786, Plate **99**, with the binomial name *Patella scapula*. In 1801 Lamarck established the new genus Dolabella for the shell figured by Rumph, with the name *Dolabella callosa*, which is of course antedated by the publication of Martyn, the genotype being now recognized as *Dolabella scapula* (Martyn).

Our anatomical knowledge of the genus is mainly drawn from the brief descriptions of Cuvier (1804), the monograph of Rang (1828), and the more recent works of Amaudrut (1886), Mazzarelli and Zuccardi (1890), Gilchrist (1894), Lacaze-Duthiers (1898), Eliot (1899), and Bergh (1905, 1907); all of which are more or less fragmentary.

The genus Dolabella so far as is known is confined to the Indo-Pacific area, ranging westward to the Red Sea and the Cape of Good Hope, eastward to the Gulf of California, the West coast of Mexico and the Gulf of Guayaquil, and southward to New South Wales. Quite a number of species have been described, most of them in an incomplete manner, and all are in need of careful detailed study and revision. Pending this the following chronological list includes all apparently valid species, though some of them may be found later to be but varieties of a few widely distributed forms.

1. **Dolabella scapula** (Martyn), 1786.

Patella scapula Martyn, Univ. conchol., 1786, **3**, pl. 99.
?Doris verrucosa Gmelin, Syst. nat., ed. 13, 1791, pt. 6, p. 3103; Barbut, Genera Vermium, 1788, **2**, pl. 4, f. 1.
Dolabella callosa Lamarck, Syst. anim. sans vertèbres, 1801, p. 62.
Dolabella sp. Cuvier, Ann. Mus. hist. nat., 1804, **5**, p. 437–440, pl. 29, f. 1–4.
Dolabella rumphii Cuvier, Règne anim., 1817, **2**, p. 398, pl. 34, f. 1; Lamarck, Hist. nat. anim. sans vertebres, 1822, **6**, pt. 2, p. 41; Ed. 2, 1836, **7**, p. 699; Krauss, Südafrikanischen moll., 1848, p. 72; Adams and Reeve, Zool. Samarang. Moll., 1848, p. 65, pl. 17, f. 4; Brazier, Proc. Linn. soc. N. S. W., 1878, **2**, p. 88; Martens, Moebius's Beitr. meeresfauna Mauritius, 1880, p. 306; Smith, E. A., Rept. zool. coll. H. M. S. Alert, 1884, p. 89; Bergh, Siboga expedition. Opisthobranchiata, 1905, p. 13, taf. 7, f. 22–40; taf. 8, f. 1–7; Vayssière, Ann. Fac. sci. Marseille, 1906, **16**, p. 51, pl. 1, f. 1–5; Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 24, taf. 11, f. 7.
Aplysia rumphii Cuvier, Rang, Hist. nat. aplysiens, 1828, p. 46, pl. 1; Quoy and Gaimard, Voy. Astrolabe. Zool., 1832, **2**, p. 303, pl. 23, f. 4, 5.
Dolabella peronii Blainville, Dict. sci. nat. 1819, **13**, p. 395; Manuel malacol., 1825–1827, p. 472, pl. 43, f. 5.
Dolabella scapula Martyn, Adams, H. and A., Gen. recent Moll., 1854, **2**, p. 32, pl. 59, f. 3, 3a; Angas, Proc. Zool. soc. London, 1867, p. 227; Pilsbry, Tryon's Manual conch. 1896, **16**, p. 152, pl. 26, f. 26–28; pl. 27, f. 29–30; Farran, Rept. Ceylon pearl oyster fisheries, 1905, no. 21, p. 354, pl. 5, f. 16, 17; Hedley, Proc. Australasian assoc. adv. sci., 1910, p. 371.

Habitat:— Widely distributed in the Indian Ocean and Western Pacific areas.

2. **Dolabella ecaudata** (Rang), 1828.

Aplysia ecaudata Rang, Hist. nat. aplysiens, 1828, p. 47, pl. 2.
Aplysia truncata Rang, Hist. nat. aplysiens, 1828, p. 47.
Aplysia tongana Quoy and Gaimard, Voy. Astrolabe. Zool., 1832, **2**, p. 305, pl. 23, f. 6, 7.
Dolabella tongensis Gray, Figures moll. anim., 1850, **4**, p. 97, pl. 137, f. 1.
Dolabella ecaudata Rang, Brazier, Proc. Linn. soc. N. S. W., 1878, **2**, p. 89; Pilsbry, Tryon's Manual conch., 1896, **16**, p. 157, pl. 25, f. 4, 5; pl. 66, f. 11, 12, 13; Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 25, taf. 10, f. 5; Hedley, Proc. Australasian assoc. adv. sci. 1909, p. 371.
Dolabella tongana Quoy and Gaimard, Mazzarelli and Zuccardi, Boll. Soc. nat. Napoli, 1889, **3**, p. 120; Mem. Soc. Ital. sci., 1890, ser. 3, **8**, p. 9, tav. 1, f. 3, 8, 12, 14, tav. 2, f. 3, 6, 13.

Habitat:— Moluccas, Philippines, Tonga Islands, Samoa, N. E. Australia.

3. **Dolabella teremidi** (Rang), 1828.

Aplysia teremidi Rang, Hist. nat. aplysiens, 1828, p. 48, pl. 3, f. 1–3.
Dolabella teremidi Lesson, Voy. Coquille. Zool., 1830, **2**, pt. 1, p. 293; Lamarck, Hist. nat. anim. sans vertèbres, ed. 2, 1836, **7**, p. 700; Deshayes, Moll. Île Réunion, 1863, p. 53.
Dolabella temnida Gray, Figures moll. anim., 1850, **4**, p. 97.
Dolabella termida Gray, Figures moll. anim., 1850, **4**, p. 29.
Dolabella teremidi Martens, Moebius's Beitr. meeresfauna Mauritius, 1880, p. 306; Mazzarelli and Zuccardi, Boll. Soc. nat. Napoli, 1889, **3**, p. 120; Mem. Soc. Ital. sci. 1890, ser. 3, **8**, p. 7, tav. 1, f. 2, **9**, 12, tav. 2, f. 2, 9; Pilsbry, Tryon's Manual conch., 1896, **16**, p. 154, pl. 63, f. 9–11; Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 27, pl. 10, f. 8.
Dolabella hasseltii Fér, Eliot, Proc. Acad. nat. sci. Phila., 1899, p. 516.

Habitat:— Society and Caroline Islands, Réunion Island, Samoa, Philippines.

4. **Dolabella gigas** (Rang), 1828.

Aplysia gigas Rang, Hist. nat. aplysiens, 1828, p. 48, pl. 3, f. 4.
Dolabella gigas Deshayes, Moll. Île Réunion, 1863, p. 53; Sowerby, Conch. icon., 1868, **16**, pl. 1, f. 1a, b; Martens, Moebius's Beitr. meeresfauna Mauritius, 1880, p. 306; Pilsbry, Tryon's Manual conch., 1896, **16**, p. 152, pl. 65, f. 4, 5, 6; Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 26, pl. 10, f. 2.

Habitat:— Mauritius, Réunion Island, Red Sea.

5. **Dolabella hasseltii** (Férussac), 1828.

Dolabella rumphii Van Hasselt, Lettre sur les mollusques de Java. Bull. sci. nat., 1824, no. 2, 3, 4.
Aplysia hasseltii Férussac, Rang, Hist. nat. aplysiens, 1828, p. 49, pl. 24, f. 1; Quoy and Gaimard, Voy. Astrolabe. Zool., 1832, **2**, p. 306, pl. 23, f. 1–3.
Dolabella hasseltii Fér., Lamarck, Hist., anim. sans vertèbres, ed. 2, 1836, **7**, p. 700.
Dolabella variegata Pease, Proc. Zool. soc. London, 1860, p. 32.
Dolabella hasseltii Fér., Martens, Moebius's Beitr. meeresfauna Mauritius, 1880, p. 306; Mazzarelli and Zuccardi, Boll. Soc. nat. Napoli, 1889, **3**, p. 47; Mem. Soc. Ital. sci. 1890, ser. 3, **8**, p. 3, tav. 1, f. 1, 6, 7, 11, 16, 18–21, tav. 2, f. 1, 8, 17; Pilsbry, Tryon's Manual conch., 1896, **16**, p. 154, pl. 64, f. 3.

Habitat:— Mauritius, Java, Timor, Philippines, Hawaii.

6. **Dolabella hemprichii** Ehrenberg, 1828.

Dolabella hemprichii Ehrenberg, Symbolae physicae. decas 1, 1828, 1831; Pilsbry, Tryon's Manual conch., 1896, **16**, p. 156.

Habitat:— Casseir, Red Sea, Gulf of Aden.

7. **Dolabella guayaquilensis** Petit, 1868.

Dolabella guayaquilensis Petit, Sowerby's Conch. icon., 1870, **16**, pl. 2, f. 6a, b; Sowerby, Pilsbry, Tryon's Manual conch., 1896, **16**, p. 160, pl. 64, f. 1, 2.
Dolabella quayaquilensis Petit, Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 26, taf. 10, f. 6, 7.

Habitat:— Coast of Ecuador, Guayaquil.

8. **Dolabella elongata** Sowerby, 1868.

Dolabella elongata Sowerby, Conch. icon., 1870, **16**, pl. 1, f. 2a, b; Pilsbry, Tryon's Manual conch., 1896, **16**, p. 156, pl. 27, f. 31, 32; Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 25, taf. 10, f. 3, 4.

Habitat:— Indian Ocean, Seychelles Islands.

9. **Dolabella californica** Stearns, 1878.

Dolabella californica Stearns, Proc. Acad. nat. sci. Phila., 1879, p. 395, pl. 7, f. 1, 2; Proc. U. S. N. M., 1893, **16**, p. 341; 1894, **17**, p. 158; Pilsbry, Nautilus, 1895, **9**, p. 73; Tryon's Manual conch., 1896, **16**, p. 159, pl. 66, f. 14–16.

Habitat.— Mulege Bay, Gulf of California, West Coast of Mexico.

10. **Dolabella neira** Sowerby, 1899.

Dolabella neira Sowerby, Clessin, Martini and Chemnitz's Syst. conchylien-cabinet, 1899, **1**, 8, p. 27, taf. 10, f. 1.

Habitat:— Banda Neira Island, Moluccas.

A comparison of the Easter Island specimen with the descriptions of the other known Dolabellinae renders it clear that it represents a new and undescribed species. I take great pleasure in naming it in memory of our great zoölogist and oceanographer, Alexander Agassiz.

Dolabella agassizi, n. sp.

Length 160 mm. or more, the maximum diameter 80 mm., greatest circumference 210 mm., at epipodia, tapering forward to 105 mm., at the anterior end of the bluntly conical body. Parapodia low, thick and fleshy, the dorsal slit between them one third the body-length. Posterior disc large, bounded by a smooth ridge. General surface of the body smooth, slightly tuberculate in the head-region, but destitute of cirrhi or processes. Anterior tentacles and rhinophores cylindro-conic, close together, separated by about 1/10 the body-length, bases of the rhinophores moderately wide apart.

Color light copper-green, the inner edges of the parapodia and (at least) the anterior floor of the pallial chamber vinous purple.

Shell moderately large and strong, hatchet shaped, covered with light amber cuticle. Spire loosely coiled, heavily calloused and rough. Margin broadly reflexed dorsally behind, lessening and disappearing in front. Posterior sinus deep with a narrow reflexed dorsal margin. Length 54 mm., breadth 31 mm., altitude 6.0 mm.

Habitat:— Easter Island, South Pacific Ocean.

EXTERNAL CHARACTERS.

General form and color.— The single specimen of this species was taken in shore collecting at Easter Island. The colored figure upon Plate 1 is reproduced from a water-color drawing, painted from life by Mr. Agassiz. No notes accompanied the drawing other than the memorandum that the color "should be a little more copper-green." A comparison with other figures of different members of the Dolabellinae, notably those given by Rang (1828), would indicate that this specimen was probably somewhat contracted, and not moving about freely while being painted. In the preserved condition the body-form is bluntly conical, its posterior end being abruptly terminated by an oblique disc from above backward, with prominent smooth and slightly sinuous outlines. The general surface of the body, save for general longitudinal corrugations manifestly due to shrinkage, is fairly smooth, a few low scattered tubercules being recognizable along the dorsum and in the head-region, as shown in Plate 1. Nothing resembling the highly developed fleshy processes or cirrhi, characteristic of most described species, is present. In this respect it resembles *Dolabella ecaudata* (Rang) more than any other form. Shrinkage has caused the posterior disc to be set off from the otherwise smooth surface of the foot by a deep ditch-like corrugated area.

The anterior end of the body is bluntly rounded, and is so strongly invaginated that the tentacles and mouth-parts are completely introverted into a cavity. From the figure, Plate 1, it is seen that the anterior tentacles are short and bluntly cylindrical, while the rhinophores are of the same general shape, their bases not close together, but set far forward on the head, more so than in other species. On careful eversion the anterior tentacles are found to be rather narrowly auriculate, while the rhinophores are of the same cylindrical form, with a narrow longitudinal groove upon their outer posterior margin.

Dimensions.— In the preserved specimen the greatest length of the animal is 16.0 cm., and its greatest transverse diameter is 8.0 cm. The circumference at the highest point of the epipodia is 21.0 cm., tapering to 10.5 cm. at the anterior end of the body. The posterior disc is 8.0 cm. in transverse diameter, and 5.5 cm. in vertical height, its circumference measuring 25.5 cm. The total length of the epipodial slit is 7.58 cm., its anterior end being nearly midway of the body-length. No measurements are at hand of the animal during life, but they were probably considerably greater than those here given.

Foot.— The ventral surface, or foot, passes uninterruptedly over into the sides of the body and is uniformly smooth, save for contraction rugae in its anterior and posterior portions. The anterior end of the foot is curved upward and invaginated with the whole head-region.

Epipodia.— The epipodia are thick and fleshy, scarcely mobile, and are united behind the siphon at the upper side of the posterior disc for a distance of 27 mm. They are short and low, with thick closely interlocking margins, in front sloping rapidly downward to a low ridge-like fold, which terminates just in front of the middle of the length of the animal. The anterior ends of the epipodia are 4 mm. apart, but little more than the width of the genital groove, which emerges between them. Inclosed within the low margins lies a smooth flattened area of elongated oval shape, limited behind by the anterior edge of the mantle. It is 28.7 mm. in length and 15.6 mm. in greatest width. In Plate 1 this shows a light purple color, which also appears on the inner margins of the epipodia, and doubtless extends inward over the walls of the pallial cavity to a greater or less extent.

The closely appressed margins of the epipodia fit snugly together with interlocking grooves and ridges, leaving an anterior opening for the inflow of water, and a posterior rounded one, somewhat above the centre of the disc for its exit. On reaching this posterior foramen, the inner thin edge of the epipodium curves over to the outside of the margin, and is prolonged around the opening in an irregular curve on the face of the disc, receding from and approaching the thickened edge of the opening in a number of sinuous bays. The boundary of these bays is a low sharp-edged fold, averaging 1 mm. in height, and incloses an area not appreciably different in its surface texture from the remainder of the posterior disc. No trace of this is to be seen on Plate 1, nor have I found anything similar in *D. hasseltii*. Its significance is unknown.

The external spermatic groove appears from beneath the anterior end of the mantle, and continues forward in the median line as a sharply defined furrow with prominent margins. At the anterior end it diverges to the right and enters the invaginated portion of the body in the preserved specimen. As seen in Plate 1, in the living animal it curves forward and downward to the right below the base of the right rhinophore, to the opening of the penis-sheath, which it enters below the right tentacle.

Pallial complex.— Separating the margins of the epipodia a roomy cavity is disclosed, the mantle, covering the ctenidium, partially dividing it into an upper and a lower chamber, which communicate widely at the right side. In

the centre of the dorsal surface of the mantle the shell is visible through the large triangular shell-foramen. This opening, (Plate 6, fig. 1, *l*) is nearly of the form of an isosceles triangle, the apex directed forward, and measures 23.5 mm. in length. In Plate 6, fig. 1, the relations of the mantle to the other organs of the pallial cavity are represented, the ctenidium, however, being omitted. The epipodia have been removed, the outline of their bases being represented by the continuous line *a*, while the dotted line *k* indicates the projection of their upper margins upon the structures below. The mantle is attached to the dorsal wall of the body to the left of the dotted line *c*, which represents the outline of the shell, the triangle *l* indicating the widely open foramen of the latter. Near the median line in front, above and to the left of the spermatic furrow *i*, the free margin of the mantle begins, and is shown by the continuous line *d*, which passes in a gentle curve to the right and backward, then more sharply to the left side, where it is continued into an erect auriculate lobe, the siphon, *s*. The siphon is highest on the left side, and behind rapidly descends around the anal opening, *f*, as a thin low fold of integument, which continues to the right and forward as a stronger fold, *g*, 2.5 mm. in height, along the floor of the branchial cavity to the common reproductive opening *h*, the upper margin of which it forms (Plate 4, fig. 3, *a*). The ventral surface of the mantle is very glandular and of a dark brown color. Toward the posterior margin it is thickened and reflected in a prominent flap *e*, as noted by Gilchrist (1894), for *D. rumphii* [= *scapula*]. In the Easter Island species, however, the reflected lobe is present only at the right posterior angle of the mantle, where it is quite large, the reflected margin extending so far as to overlie a portion of the shell-cavity.

The rear wall of the pallial chamber is formed by the union of the epipodial lobes behind the siphon, the main portion of the oblique posterior disc of the body being made up of the fused epipodia. The round excurrent foramen is 20 mm. above the floor of the pallial cavity at the base of the posterior wall. Above the mantle the roomy pallial cavity extends downward upon the left side nearly as far as upon the right.

Figure 5 of Plate 6 represents the pallial organs as disclosed by the removal of the most of the mantle. It has been cut away along the double line *m*, which represents its section close to its origin from the dorsal body-wall. As in Plate 6, fig. 1, the line of the base of the epipodia is represented by *a*, the dotted line *k* indicates the projection of their free upper margin, while *b* is the circumference of the oblique posterior disc. Below the mantle the relatively large ctenidium is shown, its free portion curving backward in the pallial cavity in almost a

complete circle, the tip resting in the siphon. The afferent and efferent vessels of the ctenidium are indicated by *af* and *ef* respectively, and all that portion of the gill lying to the right of a line joining these two points is the free portion, while the remainder on the left is attached in front and behind to the body-wall. The ctenidium is of the folded type, the folded portions alternating above and below the gill-axis. Between each set of folds on either side is found an oval opening leading into the reverse side of the corresponding folds of the opposite face of the gill. These openings are represented in the figure by the row of darkly shaded areas upon the dorsal surface of the ctenidium. Similar openings are to be found, alternating with these upon the ventral side. The length of the ctenidium, measured along its outer margin, is approximately 90.0 mm., 22.0 mm. of this being along the attached area.

At the anterior end of the ctenidium upon its ventral surface, is a small elongated depression (Plate 6, fig. 5, *o.*) with rather prominent boundaries, the osphradium. It lies directly in the path of the inflowing current of water between the parapodia.

The external spermatic groove, *i*, leads back to the genital opening, *h*, lying below the anterior portion of the ctenidium. The position of this opening does not agree with that given by Pilsbry in Tryon's Manual, 16, p. 150, in which the location of the genital opening beneath the posterior part of the ctenidium is stated to be one of the characteristics of the Dolabellinae. A similar location in front of the middle of the gill is also found in all the specimens of *D. hasseltii* that I have examined.

The anus is a pocket-like opening situated just within the low posterior wall of the siphon, slightly to the right of the median line. Its margin is scarcely elevated, save in front.

The posterior mantle-margin is continued into the siphon, (Plate 6, fig. 1, 5, *s*), the left and anterior walls of which reach a height of 7.0 mm. The posterior wall drops down rapidly into a scarcely perceptible fold behind the anus. In this form it may be traced to the right and downward to rise into a well-marked fold or ridge, which continues forward on the floor of the pallial chamber to the genital opening, (Plate 6, fig. 1, *g*). In the median line, in front and to the right of the base of the siphon, a thickening in the floor of the pallial chamber forms a nearly circular disc, or button. The thickened margin of this disc is best developed on the right side, and is elevated ca. 3.5 mm. above the floor of the pallial chamber, becoming slightly less in front, (Plate 6, fig. 1, *n.*, fig. 5, *c.*). As pointed out by Gilchrist (1894) a similar button-like elevation in

D. rumphii [= *scapula*] might be raised so as to close the posterior opening completely, when the epipodial margins are closely appressed, thus converting the pallial cavity into a sac, open only in front. He suggests that the forcible ejection of the water contained in this cavity under such conditions might suddenly propel the animal backward, as is done in the nearly related Notarchus (Vayssière, 1885, p. 81) and in the Cephalopoda. No record has ever been made of any such habit so far as I am aware.

The hypobranchial gland, or organ of Bohadsch, is a diffuse structure made up of an enormous number of tubules opening independently in the floor of the pallial chamber at the right of the genital opening and the spermatic groove. It extends from the anterior end of the chamber backward as far as the posterior end of the base of the ctenidium and the region of the rectum, the total area occupied being somewhat semicircular in outline, and reaching a length of 44.0 mm., and a width of 23.0 mm. The body-wall of this region is very spongy in texture, being made up almost entirely of the felted mass of gland-tubules, the actual integument being quite thin in this location.

The external renal opening is a minute inconspicuous pore, situated below and near the posterior end of the base of the ctenidium.

Shell.— The shell (Plate 4, fig. 2) is moderately large and strong, hatchet shaped, with a deep posterior sinus. The dorsal cuticular portion is well developed and of a light amber color. The calcareous portion was somewhat broken, so that the exact limits of its extent forward and toward the right or younger margin could not be determined accurately. The spire is loosely coiled and heavily calloused and rough. Along the back the margin is rather broadly reflexed posteriorly, becoming narrower in front and disappearing before the anterior end of the shell is reached. Toward the apex this reflexed margin broadens and is continued into the apical calloused area. The margin of the sinus is similarly, but more narrowly reflexed. The shell is 54.0 mm. in extreme length by 31.0 mm. in width, with an approximate altitude of 6.0 mm.

INTERNAL ANATOMY.

Owing to the lack of material a complete description of the anatomy of *Dolabella agassizi* cannot here be given, the more important systems alone having been studied.

Alimentary tract.— The specimen was dissected from below, a mid-ventral longitudinal incision being carried the full length of the foot. The sole of the foot is strong and muscular, reaching a thickness of 3.0 mm. in front and thinning away behind to 2.0 mm. The inner surface of the pseudo-peritoneum is greenish black in color.

The retractor muscles of the head-region are very strongly developed in the form of a series of broad bands, arranged in the form of an incomplete cone, being absent on the ventral side alone. They arise in the posterior portion of the body-cavity at varying distances from the posterior disc-region, and are inserted at the anterior end in the zone between the rhinophores and the anterior tentacles. It is by the powerful contraction of this group of muscles that the complete inversion of the head-region is brought about.

Pharyngeal bulb.— The relatively small pharyngeal bulb is nearly cylindrical in form, 18.5 mm. long by 14.3 mm. broad and about the same in height. The dorsal, ventral, and lateral faces of the bulb are slightly flattened. Anteriorly it receives the short and broad mouth-tube, and posteriorly it continues into the wide oesophagus, nearly equal in diameter to the bulb itself, a slight external ventro-lateral constriction marking the passage of the one into the other, the slightly yellowish color of the bulb giving way to the bluish gray tone of the oesophagus.

In the specimen at hand the complete introversion of the head-region, extending back beyond the rhinophores, makes the arrangement of the muscles of that region not evident at first sight. The strong retractors of the bulb arise close to the union of the mouth-tube with the body-wall, and are scarcely to be distinguished from the general system of retractors of the whole head-region, their insertion being the same, save for a single pair of dorsal retractors, which are inserted above the bulb.

From the ventral face of the pharyngeal bulb a series of short narrow flat muscles arise, which pass forward and are inserted into the anterior end of the foot. Four of these inferior protractor muscles are found upon either side

of the median line, and they are all of nearly equal size, narrowing from a broad origin to about 0.7 mm. in diameter.

From the dorsal surface of the bulb arises a strong pair of muscles, the superior protractor muscles which diverge forward and outward to their insertion in the antero-dorsal body-wall, above the mouth.

From the postero-lateral face of the bulb arise the long slender dorso-lateral protractor muscles. These are formed on either side by the union of a broad system of superficial muscles from the postero-lateral region of the pharyngeal bulb into a narrow band, which passes upward and forward to an insertion in the body-wall at the side of the mouth.

From a deep origin slightly in front of the middle of the bulb arise the very strong paired ventro-lateral protractor muscles. They pass upward, forward, and outward to the antero-lateral body-wall.

Plate 8, fig. 5, illustrates the arrangement of the internal structures of the pharyngeal bulb as seen in a dorsal view. The bulb has been slit longitudinally in the median line and the sides reflected. Guarding the opening at the anterior end is the pair of lateral mandibles, *m*, behind these in the median line is the large radula, and on the roof of the cavity, above and behind the radula are the spinous palatal folds, *l. f.* The structure of each of these will be taken up in detail.

Mandibles.— The amber colored mandibles are in the form of two strong triangular plates on the sides of the mouth-opening. They measure 7.5 mm. in height and 4.0 mm. in greatest width. The broader basal portions are wide apart, being separated by fully 7.6 mm. while the apices nearly meet in the median line above. Plate 8, fig. 4, exhibits the relations of the mandibles in *D. hasseltii* as seen in a transverse section of the pharyngeal bulb. The plane of the section passes somewhat behind the tip of the mandibles, in about the region indicated by the dotted line *m*, (Plate 8, fig. 5). This causes the tips of the mandibles to seem much more separated than they really are. The anterior edge of each mandible is frayed and broken through use, while the posterior border disappears in a deep sulcus of the wall, in which the mandible is developed. This is shown at *g* Plate 8, fig. 4, and in detail Plate 7, fig. 1. The cuticle (Plate 8, fig. 4) is everywhere much thicker than the underlying epithelium which produced it, as shown by the narrow shaded basal band, representing the latter, in comparison with the clearer strip above it. In the region of the mandible the cuticle becomes much increased in thickness and is differentiated into rodlets. These are closely packed structures of a slightly

compressed prismatic form, their distal ends appearing usually as somewhat elongated polygons when seen in surface view, (Plate 8, fig. 7). Here *a* represents the younger region of the mandible, toward the bottom of the sulcus, while *b* is toward the outer or older border. The rodlets are longest near the middle of the mandible and are shortest at the bottom of the groove or sulcus in which they are produced (Plate 7, fig. 1). The distal end of each rodlet is terminated by a strong oblique cap, the anterior edge of which tends to overlap the next one in front of it. Each rodlet tapers somewhat toward its proximal or basal end and rests upon a single epithelial cell in the posterior half of the mandible, of which it is plainly a cuticular differentiation. The development of these rodlets may be followed in fig. 1 and 2 of Plate 7. The whole pharyngeal cavity is lined by a single layer of columnar epithelial cells, bearing a cuticle of varying thickness. At the posterior margin of the mandible this epithelium is invaginated into a deep sulcus, as before described, the innermost portion of which is slightly inrolled forward (Plate 7, fig. 1 *c*., fig. 2). The cells forming the floor of this groove secrete the mandibular rodlets, a single one being produced by each cell. At the bottom of the sulcus the rodlets are shortest and youngest, appearing as a thin light yellow cuticular layer. New layers are added beneath this outermost deposit successively, and various stages in the growth of the rodlet may be met with in series toward the front. About midway of the width of the whole of the mandible the rod-forming cells cease the production of these layers, and take on the formation of a common basal cuticular secretion, upon which the anterior rodlets are borne (Plate 7, fig. 1, *b*). This homogeneous substance first appears as a narrow band between the epithelial cell and its rodlet, and increases progressively in thickness toward the anterior border. Beyond the mandible it continues as the common thick cuticular lining of the mouth-tube, homogeneous save for slight indications of stratification parallel to the basal epithelium. The maximum length of the rodlets is thus reached about midway of the width of the mandible, and the progressive shortening seen from that region forward is evidently due to the wearing away of their distal ends, until the rodlet itself finally breaks away and disappears, as at *a*, Plate 7, fig. 1. While this is taking place along the floor of the mandibular sulcus the epithelium forming its upper wall or roof is secreting a continuous mass of chitin (Plate 7, figs. 1, 2, *d*) which fills up the remainder of the space above the rodlets. This upper layer is faintly striated and extends well forward beyond the edge of the sulcus, gradually thinning away as the region of the anterior margin of the mandible is approached. Thus

only the most anterior of the rodlets are exposed to the attrition of use, the remainder being covered by the projecting layer of cuticle.

Under a high magnification the innermost portion of the mandibular sulcus is shown in fig. 2, Plate 7, and merits somewhat closer examination. The epithelial cells, *e*, are of a high columnar form, and each one bears upon its distal end a single rodlet, in successively later stages of formation from the bottom of the groove outward. The distal end of the cell is nearly flat or but slightly convex while the first layers of chitin (conchin) are produced, but becomes more arched in the later stages, until it reaches a high conical form, as shown at the right side of the figure. The corresponding layers of each rodlet are similarly arched, the outermost ones but slightly, while those more recently formed are more and more curved. The margin of each successive layer forms a ridge upon the surface of the rodlet, as is more clearly seen in fig. 3 and 4 of Plate 7, in which a fully formed rodlet with its basal cell is contrasted with a much younger one. The volume of the basal cell in the older stage is very strikingly less than that of those in the earlier stages. The nuclei of these basal cells, or rhabdoblasts, are large, oval in outline, and deeply staining, with many irregular chromatin granules. The cell-protoplasm is longitudinally fibrillated, a great complex of fine fibrillae being readily made out, extending throughout the cell and continuous, indeed, through the substance of the rodlet itself. This is shown (Plate 8, fig. 3*a*), in three basal cells from the younger portion of the mandible. But two layers of the rodlet have here been laid down, and the fine fibrillae of the cytoplasm may be followed out into them for varying distances. The same may be noted, Plate 8, fig. 1, in a group of seven basal cells from an older portion of the mandible, only the innermost part of their rodlets being shown.

Plate 7, fig. 2, and Plate 8, fig. 1, 3, also show the strikingly intimate manner in which the ends of the underlying muscle-fibres are related to the epithelium of the mandible. Immediately below the epithelium is a strongly developed faintly striated layer of compact connective-tissue, with scattered cells, and below this the connective-tissue is more loosely arranged. Numerous smooth muscle-fibres pass up through this compact layer, branching in it and continuing up among the epithelial cells, where they ramify still more, and terminate in close contact with the bases of these cells. In fig. 3 of Plate 8 two such muscle-fibres are represented, penetrating and branching in the connective-tissue layer *f*, and from thence ramifying between the bases of the epithelial cells *e*. Since the figure was drawn with a minimum change of focus,

many of the finer terminations pass out of the plane of vision. In fig. 1, Plate 8, two groups of muscle-fibres *b*, *b*, terminate in the same manner. Here also a change of focus shows that the interlacing feltwork of the fine branches is even more extensive than here shown. So far as this material permits conclusions to be drawn there exists a continuity of the finest prolongations of the muscle-fibres with the epithelium-cells. An actual continuity of the myofibrillae with epithelial fibrillae, such as described by Brück (1813) for Anodonta and Cyclas, and by many other writers for arthropods, could not be satisfactorily established, though there is much to favor its existence.

Radula.— Immediately behind the mandibles lies the large and strong deep amber radula. *In situ* its exposed surface presents a conventional heart-shape, as seen from above, the anterior narrower end being abruptly rounded and continued downward into a deep groove in front and laterally. The dorsal groove of the radula is deepest behind, and extends forward two thirds the length of the organ, becoming shallower in front, while behind it merges into a transverse groove. The highest portions of the radula thus form the sides of the median groove, and round over toward the sides and more abruptly in front. The rows of functional teeth curve around over this elevated surface, in general parallel to its external contour, Plate 8, fig. 5. Deep in the median groove the youngest teeth are covered with the epithelium of the sheath. When freed from its attachments, cleaned, and flattened out, the shape of the radula is approximately rectangular, the sides being nearly parallel, the posterior border nearly straight, while the anterior margin is bluntly pointed. In extreme width it measures ca. 18.4 mm., in median length, 14.3 mm., while the sides are 11.8 mm. long.

The teeth are arranged in sixty-two transverse rows, the first four of which are incomplete, worn, and broken. Succeeding these are thirty-six rows which are exposed and functional, and then twenty-four rows which are still inclosed within the radula-sheath. The number of teeth in each half row varies, increasing from before backward from 170 in the eighth, and 198 in the twenty fifth to a maximum of 230 in the forty second row. The dental formula of *Dolabella agassizi* may hence be given as $62 \times 198\text{–}230 \cdot 1 \cdot 198\text{–}230$, there being a single median tooth in each row, and the total number of teeth probably being not far from 25,000.

The median tooth is but little more than an elongated slightly flattened rudiment in the first twelve rows of the radula (Plate 6, fig. 3, 4). Further back it develops a transverse club-like anterior thickening, the tip being curved

upward, with a thinner median prolongation shading off into the flattened posterior end of the tooth (Plate 6, fig. 6–8). Occasionally an evidence of a short bluntly pointed compressed median hook appears at the anterior end, (Plate 6, fig. 9) which represents the median tooth from the fifty ninth row, but no lateral denticulations, such as those figured by Bergh (1905) for *D. rumphii* [= *scapula*] are to be found. The structure is likewise much simpler than that found by Mazzarelli and Zuccardi (1890) in *D. hasseltii*, *D. teremidi*, and *D. tongana* [= *ecaudata*], and by Farran (1905) in *D. scapula*, the only other species of Dolabella whose radulas have been described and figured. In length the median tooth ranges from 0.192 mm. to 0.210 mm., in width at the anterior end 0.012 mm. to 0.018 mm., at the posterior end from 0.063 mm. to 0.084 mm.

The lateral teeth are simple strongly compressed hooks borne vertically upon the surface of the radula-membrane. In general they differ but little in size and form, the first three or four inner laterals being slightly smaller than the remainder, while the outermost four or five decrease rapidly in size. A typical lateral tooth from the posterior portion of the radula is shown in side view in Plate 6, fig. 2. The base, *a–b*, is straight and narrow, averaging 0.246 mm. in length, and 0.012 mm. in maximum width. Its posterior end, *b*, slopes rapidly downward to the surface of the cuticular membrane, to which the teeth are attached. From the anterior end rises the strong but narrow hook, *a–c*, its anterior margin thickened and supported behind by a thinner median part. The tip is blunt and rounded, though occasionally slightly bifid tips may be found. The vertical height of the hook above the bottom base line averages 0.336 mm., and its thickness is the same as that of the base, 0.012 mm. Here and there abnormal teeth may be seen, apparently formed by the fusion of two normal ones, the united hooks being more or less separated toward the tips. Such an abnormal form is usually repeated at the same point in successive rows of the radula throughout the whole or the greater portion of its extent, being caused by some malformation of a definite group of odontoblast cells at the bottom of the radula-sheath, each successive tooth produced by them being similarly deformed. An instance of this (Plate 5, fig. 3) represents the four innermost teeth of the thirtieth row. The hook of the fourth of these worn teeth is broad and deeply bifid, as is also the base. Four teeth from the corresponding position in the fifty sixth row are given in Plate 5, fig. 5. The same bifid condition is found in the fourth tooth here, the division of the hook, however, being nearly complete. These teeth are from within the radula-sheath and have not yet been exposed to wear, though the tip of the innermost one has

been broken off accidentally. In all the other rows of the radula this malformed tooth appears in a corresponding position to those here figured.

Our information respecting the dentition of the Dolabellinae is very meagre, being limited to a paper by Mazzarelli and Zuccardi (1890), one by Eliot (1899), one by Farran (1905), two by Bergh (1905, 1907), one by Vayssière (1906) and the figures given by Pilsbry in Tryon's Manual, **16**, Plate 67, fig. 17, 18. In these papers the radulas of five species are described of the fifteen or twenty more or less doubtful species which have been recorded. In general a uniform type of dentition prevails, the number of rows and the number of teeth in each row being indefinite, and varying with the size and age of the animal. The dental formula of *D. scapula*, for example, ranges from 44 × 120–1–120 (Farran) to 45–60 × 120–160–1–120–160 (Vayssière), and 60 × 200–1–200 (Bergh). The formula for *D. agassizi* is at present the highest recorded, being 62 × 198–230–1–198–230. Nor are any striking differences to be found in the form and size of the individual teeth in these species. The median one is small and inconspicuous, with its hook small, rudimentary, or absent (*D. californica*). Eliot states that the median tooth is entirely wanting in *D. hasseltii* from Samoa, but in my serial sections of the pharyngeal bulb of a specimen of this species from the same locality I have no difficulty in recognizing it as a flattened plate bearing a small hook, so his observation is probably erroneous. Nor do I find any such complicated forms of teeth as those figured by Mazzarelli and Zuccardi (1890, tav. 1, fig. 16, 18–20), and am inclined to question their interpretation of the microscopic appearance of the teeth, which, as is well known, is often by no means an easy matter. The statement of Bergh that the median hook of *D. scapula* is finely denticulate is not confirmed by Vayssière nor by Farran. The lateral teeth are uniformly simple compressed hooks of regular form and of fairly uniform size, the dentition as a whole thus differing widely from the type characteristic of all other genera of the Aplysiidae, in which strongly developed median and lateral teeth with complicated denticulations are found in every species. With what this striking difference may be correlated is not evident, in the lack of any information as to food, habits, etc.

Palatal folds.— The postero-dorsal region of the pharyngeal bulb, directly overlying the radula, bears a pair of flap-like reduplications of the dorsal wall, which project obliquely downward and backward into the cavity (Plate **8**, fig. 5, *l. f.*). These folds are of an elongated triangular form, the pointed apex being directed forward, while the posterior free end is rounded and lobe-like. They are continuous with the dorsal wall of the bulb along their outer margins,

the inner free ones are thick and fleshy and nearly meet each other in the median plane. Thus they form the incomplete floor of a dorsal space, of a more or less elongated triangular form, limited behind by a low transverse ridge (Plate 8, fig. 5, *f*), which unites the posterior ends of the palatal folds across the median line, though communicating freely with the oesophagus beyond. This space is the "doccia faringea" of Zuccardi (1890) or pharyngeal groove, and is considered as a prolongation of the dorsal portion of the oesophagus, the palatal folds being his "creste pharynge," or pharyngeal crests. It communicates freely with the cavity above the radula and loses its identity as a separate groove before reaching the region of the upper ends of the mandibles, contrary to the observations of Zuccardi in the Neapolitan Aplysiidae. Into the anterior portion of this space the ducts of the long strap-like salivary glands open.

Palatal spines.— Each of these palatal folds bears thickly set tapering spines on its ventral surface, their tips being directed obliquely backward. The tips are brown or of a deep amber color, while the main portion of the shafts is lighter amber or whitish. The spines are quite flexible, readily bending on pressure with a needle. In length they range from 0.24 mm. to 0.5 mm., with a basal diameter reaching 0.096 mm. as a maximum. They are gently tapering throughout their extent, with the tip abruptly curved backward, as shown in Plate 9, fig. 1, 8. The surface of each spine is obliquely ridged by a series of parallel elevations, corresponding to strata of growth which extend through its whole thickness. The lower one half to two thirds of the spine bears a moderate, shallow groove upon its posterior surface (Plate 9, fig. 1). Toward the posterior border of the palatal fold the spines become more slender and filiform (Plate 10, fig. 9). All the palatal spines are imbedded in a thick chitinous or cuticular matrix, from which the distal ends of the longer spines alone project. In a surface view of a total preparation, isolated with KOH, this matrix is so clear and transparent that it is readily overlooked, the spines appearing entirely free save at their bases, but in transverse sections, as in Plate 9, fig. 7, *b*., its presence and true nature is evident. Beneath this general cuticular layer is situated a high columnar epithelium of slender cells which secrete it. The nuclei are small, contain fine chromatin granules scattered on a delicate linin network, and are situated in the basal half of the cell. The distal half is filled with fine granules, extending down to the zone occupied by the nuclei. Near the anterior border of the palatal flap these granules are especially numerous, and frequent evidence of a discharge of a homogeneous secretion from the cells into the cuticle is seen, Plate 10, fig. 7. This secretion is most marked in the

lower layers of the cuticle, and gradually decreases, and becomes blended with the strata toward the middle and upper portions. In the outer layers the cuticle appears entirely homogeneous, save for the indications of the successive parallel layers of deposition from the epithelial cells.

At intervals among these smaller epithelial cells single gigantic ones are to be found, each of which lies at the base of a palatal spine, and apparently produces it (Plate 9, fig. 8, *b*). These cells are usually found at the bottom of slight depressions below the general level of the epithelium. This matrix-cell often reaches a diameter of 0.10 mm. in width by 0.04 mm. in height, extending the full width of the base of the overlying spine (Plate 9, fig. 3). The bulk of the cell is finely granular, the upper portion, however, is often more coarsely so, and is sometimes very vaguely limited, being broken up into a mass of rounded granules of irregular size, underlying the base of the spine, the whole appearance strikingly suggestive of poor fixation, which is very probably the case.

The very large somewhat flattened spheroidal nucleus occupies the basal region of the cell, lying close to the basement-membrane. It contains clearly defined chromatin granules, and one or two nucleoli. The basal portion of the cell frequently bulges downward below the general level of the epithelium and not infrequently extends below the bases of the adjoining cells as in Plate 9, fig. 3. In some cases it somewhat resembles a large nerve-cell, but careful study fails to reveal any trace of a nerve-fibre proceeding either from or to it. In some sections, near the margin of the base of a spine, such cells appear to be subepithelial in position, as is seen in Plate 9, fig. 3, in the large cell adjoining the matrix-cell of the spine. This is, however, the matrix-cell of an adjoining spine not shown in the figure.

All stages of the development of these palatal spines may be found scattered irregularly in sections, as each spine passes through its developmental history irrespective of its neighbors. One of the earliest stages is shown in Plate 9, fig. 2. The finely granular matrix-cell is smaller than in later stages, but is much larger than the adjacent ones. Upon its distal end, which arches above the general level of the surrounding epithelium, is borne a thin cap of a highly refractive substance, the beginning of the young spine. In Plate 9, fig. 4, the matrix-cell has much increased in size, and its chitinous cap has already become so thickened that its substance appears in two layers. The apex of the spine is already outlined by the oblique growth of the first strata. In Plate 9, fig. 5, 6 further stages in development are shown, and they could be readily

multiplied. In Plate 9, fig. 8, the spine has reached nearly its full size, but is imbedded so deep in the common cuticula that its apex is some distance below the free surface. In fact but very few spines retain their connection with the basal matrix-cell when the wearing away of the general surface exposes their tips. When each spine reaches a length of approximately 0.5 mm. the further deposition of basal layers by the matrix-cell ceases, and the spine becomes separated from it and is simply imbedded in the surrounding cuticle. The continual formation of the cuticle below and its erosion above brings the tip of the spine to the surface and successively the remaining portions (Plate 9, fig. 7), the spines being evidently harder and more resistant than the cuticle surrounding them. The base of the spine is carried farther and farther away from the epithelium by the continued formation of new layers of the general cuticle, while its upper portion is progressively more and more exposed above, finally becoming entirely free, and falling away. The basal cell appears to enter upon the formation of a new spine in a short time, as frequent instances are found in which a very young spine is in process of development immediately beneath the base of a mature one, which has evidently been produced by the same matrix-cell.

This relation of the palatal spines to the epithelium and to the common cuticle is shown in Plate 9, fig. 7, under low magnification. The free ends of the spines here are relatively few in number in the thin section, while others are seen at various levels. This appearance is not due to any obliquity of the section, as might be readily supposed. The plane of the section is nearly transverse to the long axis of the fold, *c* is its free margin, *a* its dorsal surface, and *b* its ventral one. At *e* there is found the typical thickness of the cuticle of the general lining of the buccal cavity. It increases very rapidly on the ventral surface of the palatal fold, but abruptly thins away to a very thin layer at the free margin. In this region a deep gland-like infolding of the epithelium occurs in all the sections, characterized by the presence of a very great number of large unicellular gland-cells extending down below the basement-membrane. Similar cells are found continuing around the free margin and over the dorsal surface of the fold. One of these gland-cells is shown in Plate 8, fig. 2. Here the epithelium had been stripped away accidentally, so that the apex *a*, showing the secretion discharge from the cell, appears at the level of the basement-membrane *d*. The nucleus of the cell is not contained in this section, but is relatively poor in chromatin. The cytoplasm in the lower proximal portion of the cell shows a fine reticulum with deeply staining nodal granules. These gradually

merge into the zone *b*, in which the homogeneous secretion increases in amount and staining quality, appearing almost black with hematoxylin at the point of discharge, *a*. In other sections this secretion, evidently of a mucous nature, is seen issuing between the epithelium-cells, and is especially abundant in the deeply infolded groove shown in Plate 9, fig. 7, near the free margin of the flap. Here the secretion accumulates in considerable amount, and issues between the thick cuticle of the spine-bearing area and the epithelium just beyond it.

Other very characteristic gland-cells are scattered just below the epithelium of the dorsal surface of the fold. Many of these show no connection with the surface, while others are united by more or less slender neck-like prolongations. A group of these cells is shown, Plate 8, fig. 6. Deeply staining nodal granulations of varying size and shape are abundant in them. Unfortunately the fixation of the limited amount of material at hand does not permit any trustworthy conclusions to be drawn concerning them.

The epithelium of the palatal folds rests upon a narrow layer of dense connective-tissue, below which are found bundles of smooth muscle-fibres, running at various angles, and surrounded by a large amount of fibrous connective-tissue. The central area of the fold is occupied by looser connective-tissue, in which scattered bundles of longitudinal muscle-fibres are located. At the base of the section, Plate 9, fig. 7, is shown the duct of the salivary gland in cross-section at *d*.

In *Dolabella hasseltii* (Fér.) similar relations of the palatal spines to the epithelium and the cuticle were made out, with some differences worthy of note. In this form the spines are slender, thick-walled, tapering tubes, the thickness of the walls increasing and decreasing at regular intervals in coincidence with a system of parallel ridges and depressions of the outer surface. Each spine is the product of a single matrix-cell, the central free end of which is prolonged into the tubular base of the spine, while the wall itself is secreted by the zone of the cell-surface around this projection. Thus the spine fits down over the prolonged tip of the cell in the form of a conical cap, the successive layers of chitinous substance being in the main secreted by the sides of the distal end. The central portion, however, takes part in this secretion at intervals, the layers then formed appearing as several curved dome-like sheets, bridging across the entire lumen of the spine and continuing downward as part of its sides. No indication of the participation of any of the surrounding cells in this secretion could be found, nor is anything here present similar to the small central cell which determines the cavity in the spicule-development in the Solenogastres, as described by Heath (1911, p. 28).

In *D. agassizi* the palatal spines are entirely solid structures, save at the extreme base, where a slight depression exists, so that, while the general external form and surface-configuration is very much the same as that in *D. hasseltii*, the internal structure as seen in sections is strikingly different. The presence of palatal spines has been indicated in many of the Aplysiidae but in no case have any details been given concerning their development or structural relations. Bergh (1905, -1907) briefly describes their form and figures them for *Dolabella rumphii* [= *scapula*], this being the only reference to them in this genus.

Immediately behind the radula, on the floor of the pharyngeal bulb was found a small area of spines similar in form to the palatal ones. They are borne at the summit of a transverse crescentic fold, highest in the median line, which measures 2.0 mm. in length by slightly more in width. In the unopened tube this area would be situated just below the posterior free ends of the palatal folds and immediately behind the median groove of the radula. Unfortunately the epithelium of this region was somewhat macerated, so that further details could not be made out.

Salivary glands.— The salivary glands have the long strap-shape common in the family. They enter the bulb upon the posterior dorsal surface, the duct continuing forward near the base of the palatal folds, as shown in Plate 9, fig. 7, *d*, and opening into the cavity above the anterior portion of the radula. The posterior end of the right salivary gland loops across below the oesophagus, its tip being attached to the wall of the proventriculus, immediately in front of the masticatory stomach. The tip of the left salivary gland is similarly inserted upon the opposite side, the relations being the same as in Tethys (MacFarland, 1909).

Oesophagus.— The thick-walled oesophagus, succeeding the pharyngeal bulb is relatively short, measuring some 56.0 mm. in total length. At first it is large and roomy, ranging in diameter from 12.0 mm. just behind the bulb to 17.0 mm. at a distance of 27.0 mm. beyond it. From this point the oesophagus rapidly narrows as it passes upward and to the right, reaching its minimum diameter of 7.0 mm. just before it suddenly dilates into the proventriculus. Its mucous lining is thrown into some ten well-defined longitudinal folds, from the sides of which numerous minute and short secondary ones arise but quickly die away. The main longitudinal folds cease abruptly at the entrance of the oesophagus into the first division of the gastric apparatus, the proventriculus, or ingluvies.

Ingluvies and triturating stomach.— The ingluvies is thin-walled and rela-

tively small, much less than Tethys in its proportionate dimensions. The second, or triturating stomach lies upon the left anterior face of the posterior visceral mass, its long axis being directed downward, inward, and forward, and opening into the large saccular third gastric division. The second stomach has a thick glistening yellowish muscular wall, and is cylindrical in form, measuring 14.0 mm. in length by 22.0 mm. in diameter. Upon its inner surface are borne several rows of large strong horny teeth, which nearly close the lumen as they meet in the centre. They are readily detached from the plate-like elevations of the wall bearing them. Plate 10, fig. 1 illustrates in an outline drawing the relative size and position of these areas, the stomach having been slit lengthwise and opened out flat, and the teeth being all removed; *a* is the posterior end of the œsophagus, *b*, the ingluvies, or first stomach, *c* the thick-walled second stomach, and *d*, the roomy third division.

The largest teeth of this first grinding stomach are of a dark amber color and have the approximate form of a four-sided pyramid, the very convex base rhomboidal in outline, the sides somewhat concave, and the blunt irregular apex almost directly above the middle of the base (Plate 10, fig. 5). These largest teeth reach a height of 10.5 mm. with basal dimensions nearly the same, and are borne in a circle midway of the organ.

Behind these and alternating with them is a single row of medium sized teeth and in front of them two more rows, the nearest of medium size, the most anterior quite small. The teeth of medium size are of the same color and shape as the largest ones, though often more compressed laterally (Plate 10, fig. 2, *a* and *b*, fig. 8, 10). About nine teeth make up this group, and they pass over into that of the smaller size, in which the tooth is strongly compressed and becomes somewhat wedge-shaped (Plate 10, fig. 4, *a* and *b*). The tallest central part of such a tooth is occupied by a slightly curved axial portion of a lighter color, in which the parallel lines of growth are strongly marked. This flattened shaft extends upward from the middle of the base and forms the cusp of the tooth at its apex, and appears as if imbedded in the remainder of the chitin, especially when viewed as a transparent object. The basal length of the largest tooth of this type is 6.0 mm., its height 6.5 mm. and its width 4.0 mm.

The smallest teeth form a fourth type in shape, that of a slender conical spine, (Plate 10, fig. 3). Several of these are found in the anterior row of the second triturating stomach, but they are more characteristic of the third gastric division (Plate 10, fig. 1, *d*). Here they are smaller (Plate 10, fig. 6), and very abundant, being scattered closely over the whole inner lining. Each of these

small spines is also borne on a slightly raised and thickened disc, but they are so inconspicuous that they are not represented in Plate 10, fig. 1.

Liver and intestine.— The posterior visceral mass, made up of the remaining portions of the alimentary tract and the ovotestis, occupies nearly the whole of the body-cavity behind the head. Its ventral surface is convex, rounded behind and in front, the black liver contrasting strongly with the light yellow intestine and the reproductive gland. The dorsal surface is deeply faceted with irregular depressions, caused by the pressure of the overlying organs, notably those of the reproductive system.

At the posterior end of the third stomach, a series of low ridges in its inner layers converge toward the opening of the intestine. This portion of the digestive tract is imbedded in the liver, occupying a deep groove in its surface. The intestine passes into the right side of the liver, curving downward to its ventral surface, across which it passes to the left anterior margin, thence up to the dorsal surface, across which it passes obliquely backward, thence downward again in a loop upon the posterior surface between the liver and the ovotestis, returning after describing this curve to the right ventral side, whence it passes upward and backward to the anal opening at the base of the siphon. It thus forms in general a wide loop from below upon the left and dorsal surfaces, a disposition corresponding closely to that found in Tethys. The total length of the intestine is *circa* 300 mm., and its average diameter 7.0 mm.

At the posterior end of the third stomach, below and to the left of the pylorus, a spacious biliary cavity opens into it by a large channel. Into this cavity in turn open numerous bile-ducts, which ramify out into the poorly defined lobes of the liver. From the left of the biliary chamber the strongly curved hepatic caecum extends, approximately 25.0 mm. in length. Owing to the softened condition of the inner walls of this region the longitudinal folds dividing the lumen of the caecum and their relations to the biliary chamber and the intestine could not be made out clearly, but they appeared to be substantially the same as in Tethys (MacFarland, 1909, p. 44).

The whole alimentary canal, with the exception of the oesophagus, was quite uniformly distended with coarse detritus of an algal nature, mixed with considerable sand. In the intestine the latter was especially abundant, the organ being crowded full with it.

Reproductive System.— The reproductive system of Dolabella is composed of the following parts, which will be described in the order given.

1. Ovotestis.

2. Small hermaphroditic duct.

3. Adnexed genital complex, consisting of the nidamental and albumen glands, the fertilization-chamber, and the convoluted and spiral portions of the genital duct.

4. Spermatocyst and duct of Cuvier.

5. Large hermaphroditic duct, made up of the ovospermatic and the copulatory ducts.

6. Spermatotheca and its duct.

7. External spermatic groove.

8. Penis and its sheath.

Ovotestis.— The ovotestis occupies the posterior end of the body-cavity, in close contact with the liver in front and the body-walls elsewhere. In consequence its anterior face is irregularly faceted from the pressure of the liver and of the loops of the small hermaphroditic duct and the adnexed genital complex. The remainder of its surface is convex, conforming with the contour of the body-walls, its general form being nearly hemispherical. Its extreme antero-posterior length is ca. 23.0 mm., its diameter 35.0 mm. The yellowish gray color of the ovotestis contrasts strongly with the uniform black of the liver in contact with it.

Plate 5, fig. 4 represents the main portions of the reproductive apparatus, as seen from below, that view revealing the relations of its parts best, with but a minimum amount of displacement. The ovotestis and the penis are not shown in this figure.

Small hermaphroditic duct.— From the upper right surface of the ovotestis the yellowish white small hermaphroditic duct (Plate 5, fig. 4, *sm. h.d.*), arises, the loops of its many closely coiled windings resting upon the upper anterior surface of the gland. The approximate length of the duct is at least 65.0 mm., though its hardened condition made the measurement difficult. Its diameter averages about 3.0 mm. The general course of the duct is obliquely forward and to the right, joining the very large adnexed genital complex at its right posterior angle.

Adnexed genital mass.— The dark yellowish brown adnexed genital mass (Plate 5, fig. 4, *a. g. m.*) is strikingly large, nearly reaching the bulk of the ovotestis. In form it is irregularly prismatic, flattened somewhat dorso-ventrally and elongated laterally. It is placed transversely in the posterior dorsal region of the body-cavity, its thicker portion at the left, resting in a deep groove upon the postero-dorsal surface of the liver, and between it and the ovotestis, and is closely bound to the dorsal body-wall by connective-tissue.

Its extreme length, transverse to the longitudinal axis of the animal is 40.0 mm., its greatest antero-posterior width is 20.0 mm., while the thickness of its bulkier portion on the left reaches 14.5 mm., thinning away toward the right to some 7.0 mm. The dorsal surface is somewhat regularly convex, the ventral one quite irregular, but in general concave, as are also the anterior and posterior borders. The main bulk of this structure is made up of the nidamental and albumen glands, the windings of which are closely interlocked in the one common mass. An examination of Plate 5, fig. 4 will show its main relations. The small hermaphroditic duct, *sm. h. d*, reaches the right posterior angle of the adnexed genital mass, tapers rapidly to a third of its previous diameter, and passes diagonally across the lower surface to its mid-anterior margin. Here it curves around upon the dorsal face, forms there a broad loop and returns upon the ventral surface, *sm. h. d'*, to its posterior portion. Here the duct opens into a small irregular cavity, the fertilization-chamber, *f. c*, lying deep between the loops of the nidamental gland.

Spermatocyst.— Into the same cavity opens the duct of Cuvier, *d. C*, or duct of the spermatocyst. This organ, *spc.*, lies in close contact with the anterior border of the anterior genital complex, to which it is bound by delicate connective-tissue. It is of elongated cylindrical form with its blind end recurved upon itself, and is shown in Plate 5, fig. 4 dissected free and raised slightly from its close attachment.

Immediately at the union of the duct of the spermatocyst with the fertilization-chamber is found the opening of the copulatory duct, *c. d.* This duct is continued to the right, uniting with the ovo-spermatic duct, *ov. sp. d*, to become the left half of the large hermaphroditic duct, *l. h. d.*

Albumen and nidamental glands.— Into the fertilization-chamber also open the duct of the albumen gland, and the proximal continuation of the spiral and convoluted portions of the ovo-spermatic duct, *ov. sp. d.* By a complicated plication of the walls of this duct the massive nidamental gland is formed, which makes up the bulk of the adnexed genital mass.

Large hermaphroditic duct.— After the union of the copulatory and the ovo-spermatic ducts they leave the right posterior border of the adnexed genital complex and continue forward in a complicated series of loops as the large hermaphroditic duct, *l. h. d.* A section across this structure shows that the two ducts involved in it form simply the left and right halves respectively of a single tube, separated from each other by thick folds from the dorsal and ventral sides, which meet and interlock in the centre, thus dividing the lumen into two nearly separate ducts.

Spermatotheca.— At the distal end of the large hermaphroditic duct, just before it opens externally, it receives the duct of the spermatotheca, *sp. th.*, and also dilates anteriorly into a blind sac, the seminal receptacle, *r. s.* The spermatotheca is a large pear-shaped sac, with thin walls, lying close in front of the adnexed genital complex. Its slender duct is given off from the left side, passes backward and to the right, closely attached to the dorsal wall of the body, and opens into the left side of the large hermaphroditic duct, 16.0 mm. before the external opening of the latter is reached. The total length of the duct of the spermatotheca is ca. 26.0 mm., its diameter ranging from 2 to 3 mm. The large seminal receptacle, *r. s*, is strongly developed at the distal end of the large hermaphroditic duct. Its lumen is strongly glandular, the walls being thrown into a considerable number of high longitudinal folds which dwindle away and disappear as the large opening is approached by which the receptacle communicates with the vaginal portion of the copulatory duct.

External spermatic groove and penis.— The common external genital orifice (Plate 4, fig. 3) is located in front of the middle of the ctenidium and directly below it. In Plate 5, fig. 4 its position in relation to the internal reproductive apparatus is indicated by the cut edge of the integument at *i*. It presents two incompletely separated openings, bounded by strongly developed margins. The posterior one of these is that of the vaginal portion of the copulatory duct, the more anterior one, the ovo-spermatic duct is continued forward by the external spermatic groove, at first wide, but rapidly narrowed by its approaching sides (Plate 4, fig. 3, *l. r.*). This ciliated furrow emerges dorsally from the pallial cavity, between the anterior ends of the parapodia (Plate 1, fig. 1), is continued along the median line of the dorsum to just behind the rhinophores, then curves to the right, below the base of the rhinophore of that side and passes obliquely downward and forward along the side of the head to the external opening of the penis-sac, behind and near the base of the right anterior tentacle. This organ is in the form of a blind sac or sheath of the penis, or glans proper, which is borne within at the bottom of its closed proximal end. The sheath is located between the right side of the pharyngeal bulb and the retractor muscles of the head and its proximal end is sharply recurved dorsally. Its total length is ca. 50.0 mm., the diameter varying from 4.0 mm. in the anterior half to 6.0 mm. in the posterior portion. A strong retractor muscle terminates its posterior end, while two broad flat protractor muscles arise along the anterior dorsal and ventral margins of the sheath. The three muscles are inserted in the lateral body-wall. Into the external opening of the sheath the deep spermatic

groove passes, is continued along its inner surface to the base of the penis, and recurves along the latter to its tip. The margins of the groove are formed by two thin and prominent folds of the integument, inclosing a narrow V-shaped furrow between them. Immediately above this groove at the external opening of the penis-sheath a higher and more fleshy fold of its lining projects into its lumen, and extends backward throughout nearly the whole length of the sac, becoming lower and less conspicuous from the middle of its length backward. Numerous other lower, smaller, and more irregular folds may also be traced along the lining of the sheath for varying distances. The general color of the epidermis of the organ is a dark brown, or even black, the pigmentation extending back to about 10 mm. of the bottom of the sheath. The penis, or more exactly, the glans-penis proper, is slender, flattened throughout and pointed at the tip. It is 26.5 mm. long and 5.0 mm. wide at its base. Together with the eversible praeputium, or penis-sheath, the whole organ attains a length of 76.0 mm. The color of the glans is uniformly light yellow and it is destitute of any armature whatever.

Nervous System.— But little study seems to have been made upon the nervous system of Dolabella, the allied genera Tethys and Notarchus having fared much better in this respect. Aside from a brief paper without figures by Amaudrut (1886), the studies of Lacaze-Duthiers (1898) upon the buccal ("stomatogastric") ganglia and nerves, and very fragmentary notes by Bergh (1905, 1907), no observations have been recorded upon the nervous apparatus of this form, since the first studies of Cuvier (1804). Lacaze-Duthiers (1898) presents good detailed figures dealing with the distribution of the sympathetic nerves of *Dolabella scapula* in comparison with *Tethys* (*Aplysia*) *depilans*, and Bergh (1905) gives a rough and manifestly incomplete figure of the central ganglia of *D. rumphii* [= *scapula*]. It has, therefore, seemed very desirable to devote considerable attention to these structures in the Easter Island species.

Central nervous system.— The general features of the nervous system of *Dolabella agassizi* are similar to those characteristic of the Aplysiidae in general. Four pairs of large ganglia, the cerebral, pleural, pedal, and buccal are grouped around the posterior end of the pharyngeal bulb. The members of three of these pairs, the cerebral, pedal, and buccal are united above or below the oesophagus by commissures of different lengths, and the cerebral, pedal, and pleural ganglia of each side are united by connectives into the familiar triangular grouping, characteristic of the Gasteropoda in general. In addition to these larger ganglia the parietal and visceral ones are fused into one common mass at

the posterior end of the visceral loop, while other smaller ganglia, such as those of the anterior tentacles and rhinophores are borne at varying distances from the central group.

Cerebral ganglia.— The cerebral ganglia form an extremely flattened circular disc, lying upon the dorsal face of the anterior end of the oesophagus, just as it emerges from the pharyngeal bulb. Since they are not closely united to the underlying digestive tube a certain amount of variation in their position in reference to it may be found in different specimens, as pointed out by Lacaze-Duthiers (1898). They are inclosed in a tough sheet of connective-tissue, which forms a close envelope about them, and is prolonged out upon the nerves, and in a web-like expansion connecting them. Thus the actual size of the ganglia is obscured, but they approximate 30.0 mm. in length and breadth, the thickness being 1.5 mm. in their somewhat shrunken condition. Including the sheath the antero-posterior length is 60.0 mm., the lateral diameter is 70.0 mm. Nothing can be seen of the cerebral commissure, the paired ganglia being completely fused in the median line. Plate 2 represents a dorsal view of the central circumoesophageal group of the nervous system of *D. agassizi*, with the exception of the buccal ganglia, which are shown, Plate 3, fig. 3. The connective-tissue sheaths have been dissected away, and have been omitted entirely from the drawing for the sake of clearness. All of the nerves issuing from the ganglia appear much wider before this sheath is removed, than their actual dimensions warrant.

Cerebral nerves.— In designating the cerebral nerves the endeavor has been made to use the same serial numbering as that employed by Mazzarelli (1893), and by the writer (1909) for *Tethys dactylomela* and *T. cervina*, and to homologize it with that adopted by Amaudrut (1886) for Dolabella, and by Vayssière (1885) for *Notarchus punctatus*. The following tabulation (p. 33) of the cerebral nerves and their distribution in these forms will render a comparison simple.

The first cerebral nerve in Notarchus according to Vayssière, is the cerebro-buccal connective, which is not listed in the above table. In *Dolabella agassizi*, as will be seen by reference to Plate 2, fig. 1, the first and third cerebral nerves are united into a common trunk, *A*, for some distance from the ganglion, while the fifth cerebral nerve arises as two entirely separate trunks, *c. 5a* and *c. 5b*. Other than in these points the cerebral nerves are similar to those of the allied forms given in the table.

The nerve *A* of Plate 2, fig. 1 is the largest of the cerebral nerves of Dolabella. It arises from the anterior border of the ganglionic mass on either side,

Aplysiidae Mazzarelli.	*T. cervina*, *T. dactylomela* MacF.	*D. rumphii* [= *scapula*] Amaudrut.	*Notarchus punctatus* Vayssière.	*D. agassizi* MacF.	Peripheral distribution.
C 1	C 1	4	—	C 1	Integument between tentacles and rhinophores.
C 2 a	C 2 a	5 a	3	C 2 a	Ganglion of anterior tentacles.
C 2 b	C 2 b	5 b		C 2 b	Integument and muscles of mouth-region.
C 3	C 3	1	2	C 3	Ganglion of rhinophores and adjacent integument.
C 4	C 4	2	5	C 4	Optic nerve.
C 5	C 5	6	4	C 5 a	Integument and muscles of mouth-region. On right side a branch to the penis.
				C 5 b	
C 6	C 6	3	6	C 6	Acoustic nerve.

passes outward and forward for about 7.0 mm. and bifurcates into an inner and an outer ramus. The inner of these, *c.* 3, corresponding to the third cerebral nerve of the above table, passes at once through the overlying retractor muscles of the head to its dorsal wall, courses forward between the eyes and penetrates deeply into the integument, giving off a number of fine branches and terminating in the ganglion of the rhinophore, at the base of the latter organ. The outer ramus, *c. 1*, the first cerebral nerve, passes forward within the cone of retractor muscles of the head. On the right side, just beyond its crossing above the superior retractor muscle of the penis-sheath, it receives an anastomosing branch from the third pedal nerve, which recurves posteriorly to it. A short distance toward the cerebral ganglion from this union a branch is given off to the above named muscle, seeming to be a direct continuation of the fibres from the pedal nerve alone. Beyond this point the main trunk of the nerve curves upward and is distributed to the dorsal wall of the head in front of the rhinophores.

Outside of and behind the origin of the nerve-trunk *A*, just described above, arises another nerve but slightly smaller in diameter, the second cerebral nerve. At a short distance from its origin it bifurcates into nearly equal rami, which pass downward and forward along the pharyngeal bulb. The upper of these

two branches, *c 2a*, terminates at the base of the anterior tentacle in a small rounded ganglion, from which numerous delicate nerves ramify to the tentacle itself. The lower ramus, *c 2b*, passes forward, gives off a delicate branch to the lateral protractor muscles of the pharyngeal bulb, and is distributed to the integument of the mouth-region.

Immediately above the origin of the second cerebral nerve on the right side, but above the first cerebral nerve on the opposite one, arises a strong trunk, *c 5a*. This corresponds to a part of the fifth cerebral nerve, its remaining portion, *c 5b*, being included in the same connective-sheath as *c 2*, though with an entirely separate origin. The nerve *c 5a* passes slightly outward, and then straight forward over the pharyngeal bulb, bifurcating after a short course. The more dorsal of its rami, on the right side, gives off a delicate branch at the posterior border of the dorsal rectractor of the penis, which courses forward and ramifies to the body-wall just below the anterior end of the penis-sheath. A second small branch forms an anastomosis with the twig from the first cerebral nerve (possibly, however, coming from the third pedal nerve through the anastomosis of those two previously described, instead) and is distributed to the dorsal protractor muscle of the penis-sheath. The main portion of the dorsal ramus branches to the penis-sheath and to the integument at the side of the mouth. The more ventral ramus of *c 5a* passes directly forward to the integument of the lateral mouth-region.

The remaining portion of the fifth cerebral nerve, *c 5b*, might be considered as a separate part of the second cerebral nerve with equal justification. It is united in the same connective-tissue sheath as the latter, accompanies it in the first part of its course, and is distributed to the integument and muscles of the ventro-anterior insertion of the pharyngeal bulb in the body-wall. This distribution resembles that of the fifth cerebral more than that of the second, which is to the dorsal and dorso-lateral portion of the pharyngeal bulb insertion. Its point of emergence from the cerebral ganglion surface is entirely separate from that of either the second or the fifth nerves, being nearer the fifth on the right side and nearer the second on the left.

From the dorso-lateral surface of the cerebral ganglia, just above the origin of the cerebro-buccal connectives, the slender fourth cerebral, or optic nerve, *c 4*, arises. On the right side it crosses obliquely forward over the base of the fifth cerebral nerve and passes outward, inclosed in the same connective-tissue sheath with it along its inner border, for a short distance, before taking up an independent course. Upon the left side the optic nerve does not cross the base

of the fifth nerve, but runs along its outer border, inclosed in the same sheath for a time. The nerve terminates in the large deep blue eye, which is deeply buried below the surface in the integument, behind the rhinophores. Whether the optic nerve arises from a separate ganglion distinguishable from the cerebral can only be determined by serial sections, which have not been made of this region.

The sixth, or acoustic nerve is extremely delicate and can be traced only with difficulty. It can be made out as originating from the side of the cerebral ganglion close in front of the origin of the cerebro-pedal connective, which it accompanies to the dorsal surface of the pedal ganglion, terminating in the minute otic ganglion and otocyst, both deeply imbedded in the thick connective-tissue capsule which covers the pedal group. It is shown on the right side only in Plate 2, fig. 1, at *c6*, where it reaches the pedal ganglion, but was removed with the connective-tissue capsule on the opposite side. The long cerebro-buccal connectives, *c-b con*, arise from the antero-lateral face of the cerebral ganglia and pass obliquely downward and backward to the buccal ganglia (Plate 3, fig. 3), situated upon the ventro-posterior face of the pharyngeal bulb, immediately below the beginning of the oesophagus.

The cerebro-pedal connectives, *c-p con*, arise from the midlateral face of the cerebral ganglia and are united in a common broad sheath for the most of their extent with the cerebro-pleural connectives, *c-pl con*, which arise behind them from the postero-lateral face of the same ganglia. Together they encircle the pharyngeal bulb in a long course, and unite below with the pedal and the pleural ganglia respectively, as shown in the lower half of the figure. They measure 19.0 mm. in length, being approximately equal in this respect. A short distance from the ventral group of ganglia they separate into two distinct trunks.

Pedal ganglia.— The ventral portion of the circumoesophageal ring is completed by the pedal and the pleural ganglia, represented in dorsal view in the lower half of Plate 2, fig. 1, and in ventral view in Plate 5, fig. 2. The whole complex is united into a single lenticular mass by a thick connective-tissue capsule, which must be carefully dissected away before the relations of the ganglia and nerves may be recognized. In both the figures cited they are represented as entirely free from this sheath. The pedal ganglia are of a flattened elliptical shape, united by a short and broad commissure, 1.3 mm. long by 1.0 mm. broad, and by a slender parapedal commissure, passing below the aorta (Plate 5, fig. 2, *p-p.c*). The two ganglia are of nearly equal size, approximating 2.3 mm. wide by 3.0 mm. long.

Pedal nerves.—Nine pairs of nerves arise from the lateral and posterior margins of the pedal ganglia. They will be described in the order of their occurrence from before backward as numbered in Plate 2, fig. 1, and in Plate 5, fig. 2, the origin and distribution being the same for both right and left sides, unless otherwise indicated.

The first pedal nerve, *1*, arises as a strong trunk from the outer anterior portion of the superior face of the pedal ganglia. It passes directly forward parallel to the bulbar aorta and gives off a slender external branch, *1a* close to its origin. This ramus is distributed mainly to the anterior region of the lateral retractor muscles of the head, a large branch also forming an anastomosis with the second pedal nerve, *2*, as shown in the figure. At about 9.0 mm. from its origin the main trunk of the first nerve bifurcates, its two subdivisions each dividing in turn almost at once. The four main branches thus formed are distributed to the most anterior portions of the foot.

The second pedal nerve, *2*, is strong, upon the left side being nearly as large as the first. It arises from the antero-lateral face of the pedal ganglion, just behind and external to the first nerve, and passes obliquely forward, receiving the anastomosing branch of the first, just above the lateral retractor of the head. Passing between the fasciculi of this muscle to its outer face, it courses forward between it and the body-wall, giving off branches to the lateral rectractor and to the ventro-lateral body-wall at the margin of the foot.

The third nerve, *3*, is made up from the union of a number of delicate roots. Upon the left side three of these may be distinguished, the first arising close above the origin of the second nerve, the second from the lateral face of the pedal ganglion, while the third is not a pedal nerve but arises from the left pleural ganglion (*pl. 1*). These unite in a common epineural sheath and are distributed to the lateral body-wall in front of the eye. On the right side at least three delicate roots arise from the pedal ganglion, while a fourth springs from the right pleural ganglion and joins the first three in a common sheath. The first root appears to maintain its separate existence, the remaining three, or possibly four uniting in a common trunk a short distance from the ganglion. The group sends an anastomosing branch to the first cerebral nerve, and is distributed to the lateral body-wall in front of the eye, and to the posterior retractor muscles of the penis-sheath.

The fourth pedal nerve, *4*, arises from the ventro-lateral surface of the pedal ganglion as a moderately strong trunk. It passes outward and forward below the lateral retractor muscle to the ventro-lateral body-wall, and curves

forward along it, sending off numerous branches to it and to the anterior end of the foot. This nerve may probably be considered to be the anterior pedal nerve proper, if such a one can be distinguished from the others sending branches to this region.

The fifth, or median pedal nerve, *5*, arises as a strong trunk from the ventro-lateral face of the pedal ganglion just behind the origin of the fourth nerve. It passes straight outward and downward, bifurcating into an anterior and a posterior ramus at the junction of the body-wall and the foot. These two divisions break up into numerous branches to the median and posterior regions of the foot.

Close behind the origin of the fifth nerve is given off a nerve of nearly the same size, the sixth pedal nerve, *6*, which likewise passes outward and backward. At about 10 mm. from its origin it divides into two nearly equal branches. The more anterior one of these curves outward and forward to the body-wall, forking as it reaches it. The anterior branch thus formed enters the wall slightly above the margin of the foot, and but slightly posterior to the level of the central nervous system. It then curves forward and dorsally, and ramifies among the deep muscles of the wall. Its fellow, the posterior branch of the anterior ramus, passes backward along the inner surface of the body-wall to which it gives off small branches, finally splitting up among the deep muscles.

The posterior main ramus of the sixth nerve courses backward, bifurcating in front of the origin of the lower group of lateral retractors of the head, the branches immediately entering the wall of the body and ramifying to the deeper dorso-lateral muscles.

The seventh pedal nerve, *7*, arises at the posterior outer margin of the ganglion, immediately above the origins of the fifth and sixth nerves, and is slightly thicker than either of them. It passes obliquely backward, and, not far from its origin, splits into three nearly equal divisions, the first two of which are distributed to the anterior and median dorso-lateral regions of the body-wall. The posterior division is distributed mainly to the body-wall above and in front of the origin of the head retractor muscles, though small branches are supplied to that muscle group itself. Several anastomoses are to be found with branches from the eighth and ninth nerves, such conditions being in fact of fairly common occurrence among the finer peripheral subdivisions of most of the nerves to the integument. The distal portion of the seventh pedal nerve of the right side also enters into important relations with the nerves from the parieto-visceral ganglia, (Plate 3, fig. 2). The three terminal subdivisions,

7a, *7b*, and *7c*, of the seventh pedal nerve, *7 ped.*, form anastomoses as follows:—the branch *7a* ramifies among the tubules of the organ of Bohadsch, *o. B*, also sending a branch to unite with the nerve *1a* from the first parietal nerve, *p. 1*; *7b* sends numerous branches into the organ of Bohadsch, *o. B*, and finally unites with the recurrent branch *2c* of the second visceral nerve; while *7c*, the more anterior terminal branch of the seventh pedal, sends twigs to the dorsal peritoneum, and anastomoses with a delicate median branch of the second parietal nerve, which is distributed to the same region. These relations are substantially the same as those brought out by the writer (1909, p. 53) for *Tethys dactylomela* and *Tethys cervina*, in which forms the organ of Bohadsch is shown to be innervated from both the right pedal and the left visceral ganglia. Plate 3, fig. 1 illustrates this arrangement for *T. cervina*. Here the third pedal nerve *3 ped*, sends the branches *3a* and *3b* to the organ of Bohadsch, *o B*, which is also innervated by the recurrent anastomosing branch *2c*, from the second visceral nerve, *v2*, of the left side. In Mazzarelli's (1890), study of the organ of Bohadsch in the Mediterranean Aplysiidae he describes the innervation as from the right pedal ganglion alone, and disputes the earlier statement of Vayssière (1885) as to its innervation from the left visceral ganglion. The present writer's previous position that both authors were in part correct is much strengthened by this similar condition of double innervation, found in the more distantly related Dolabellinae.

The eighth pedal nerve, *8*, arises just behind the sixth one, from the posterior outer margin of the pedal ganglion. It is of moderate size, and passes backward and dorsally along the body-wall, sending occasional branches to the retractor muscles of the head. The main nerve bifurcates as it enters the dorso-lateral body-wall, about midway of the length of the animal, its further subdivisions passing mainly to the parapodia. Two small anastomosing branches are also given off to the posterior subdivision of the seventh pedal nerve, before the latter reaches its distribution in the organ of Bohadsch.

The ninth, or posterior pedal nerve, *9*, is the largest nerve from the pedal ganglia. It arises from the posterior border of the ganglion and passes backward below the head retractor muscles to the posterior region of the foot, where it ramifies among its muscles and those of the adjacent body-wall. Close to the origin of the ninth nerve on the left side, but some distance from that point on the right one, a slender branch, *9a*, is given off. On each side the fibres of this delicate nerve may be followed back in the common trunk to the pedal ganglion. Upon the right side this branch forms an anastomosis with a

paired nerve arising from the parapedal commissure described below. It sends a branch to the peritoneum of the diaphragm-like septum of connective-tissue in front of the stomach, and is finally distributed to the head retractor muscle near its origin. Upon the left side the relations are similar, save that no branches to the diaphragm can be identified with certainty. The final termination is the same as that of the right side, an additional delicate branch being sent to the aorta. In Plate 5, fig. 2 these relations are shown in ventral view.

The marked asymmetry described by Amaudrut (1886) as existing in *D. rumphii* [= *scapula*], due to the large development of the third pedal nerve of the right side, was not found in *D. agassizi*. From his brief description without figures I infer that his third pedal nerve corresponds to what is here described as the ninth, and which I consider to be the posterior pedal nerve. It is practically alike upon the two sides in the present form, that of the right side being slightly stouter, but the peripheral distribution being the same. As no details are given by Amaudrut of the distribution of the other pedal nerves beyond slight mention of the second, I am unable to make any further comparisons of the two forms.

Parapedal commissure.— The slender parapedal commissure (Plate 5, fig. *2*, *p-p. c.*) arises from the median ventral face of each pedal ganglion, and forms a loop, 12 mm. in length, which encircles the anterior aorta below the pedal commissure. The point of origin of the parapedal commissure is near to that of the fifth and sixth pedal nerves. Close to its origin on either side the parapedal commissure gives off a slender nerve. That of the right side curves immediately to the aorta, and bifurcates at *a*, Plate 5, fig. 2, into an anterior and a posterior branch of equal size. The anterior branch courses forward along the ventral wall of the aorta which it supplies with fine nerves. The posterior branch passes backward along the aorta and soon divides into two nerves. One of these, *d*, diverges from the aorta and passes upward and backward into the connective-tissue diaphragm in front of the stomach. The other branch, *e*, continues along the right ventral border of the aorta upward and backward toward the heart. It sends no branches to the aorta, but gives off a nerve, *f*. to the diaphragm, and then forms an anastomosis with a branch of a pedal nerve, *9a*, the united nerve thus formed, *h*, passing dorsally in the diaphragm to the superficial peritoneum in which it ramifies.

Upon the left side the homologous nerve, *b*, from the parapedal commissure loops backward in the connective-tissue bordering the left margin of the aorta and follows its left pedal branch to the foot and body-wall, ramifying in the peri-

toneum of these regions. It also forms an anastomosis with a branch of the left posterior pedal nerve, *9a*, in a position similar to that entered into by its fellow of the opposite side.

From the loop of the parapedal commissure, a little to the left of its middle point, a slender unpaired nerve, *c*, is given off. It courses backward along the ventral surface of the head retractor muscles to a point below the anterior end of the ingluvies, where it curves downward and backward through the connective-tissue septum to the foot, ramifying there in the peritoneum.

Of the above nerves the second unpaired one was described by Amaudrut (1886) for Dolabella, and has been noted in various species of Tethys by Cuvier (1804), Von Ihering (1877), Vayssière (1885), Mazzarelli (1893), and the writer (1909). The paired nerves here described as arising from the parapedal commissure have not been found heretofore in any member of the group. It may possibly be a case of a fusion of a pedal nerve with the beginning of the commissure to such an extent that it appears to be a branch of the latter on leaving it, for the nerve-cells from which the fibres spring are without doubt to be found in the pedal ganglion itself.

Pleural ganglia.— The pleural ganglia rest upon the upper posterior face of the pedal ganglia, to which they are united by extremely short pleuropedal connectives. They are inclosed with the pedal ganglia in a close common investment of connective-tissue, so that they are not distinguishable until after careful dissection and clearing. They are ellipsoidal in form, strongly flattened dorso-ventrally, and about one fourth the size of the pedal ganglia, measuring approximately 1.3 mm. in width by 1.9 mm. in length. From the upper outer face of each ganglion is given off the strong cerebro-pleural connective, which, at first independent, soon joins the cerebro-pedal connective and passes around the oesophagus with it to join the cerebral ganglia on the dorsal side.

Pleural nerves.— Each of these pleural ganglia gives rise to two nerves. The first pair of these (Plate 2, fig. 1, *pl. 1*), arise from the antero-lateral face of the ganglia immediately in front of the origin of the cerebro-pleural connective. It is very delicate and passes outward, joining the third pedal nerve in a common sheath and has a common distribution with it, as already given above in the description of the nerves from the pedal ganglia.

From the inner posterior border of each pleural ganglion arises a long and strong connective, each passing back to unite with a peripheral group of ganglia, forming the visceral loop. That of the right side is the pleuro-parietal connective, *pl-par. con*, that of the left the pleuro-visceral connective, *pl-v. con.*

Their further relations will be taken up later in connection with the parieto-visceral ganglion complex.

Immediately above the origins of these connectives, on the dorsal surface of each ganglion, is found a delicate nerve, *pl. 2*, arising from two roots. These separate roots were only made out in strong sunlight and under a binocular dissecting microscope. One of them, the innermost, arises from the pleural ganglion itself, the other springs from the cerebro-pleural connective, as shown in Plate 2, fig. 1, *pl. 2*. The second pleural nerves thus formed diverge from the pleuro-parietal and pleuro-visceral connectives respectively, with which they are at first united in a broad web of connective-tissue, and pass backward and upward over the posterior visceral mass, above the spermatotheca and enter among the muscles of the dorsal body-wall, immediately in front of the pericardium.

Mazzarelli (1893) denies the existence of any nerves from the pleural (pro-to-visceral) ganglia in the Aplysiidae. The writer (1909) has found similar ones to those here described in *Tethys dactylomela* and *T. cervina*, and they have also been noted by Amaudrut (1886) for Dolabella. Further information as to the relations and functions of these nerves is very desirable, but the lack of suitable material has prevented it.

Buccal ganglia.— The buccal ganglia are situated upon the postero-inferior surface of the pharyngeal bulb, not upon the superior-posterior surface, as stated by Amaudrut (1886). They consist of a pair of rounded ganglia, strongly flattened dorso-ventrally, and connected by an extremely short commissure. When exposed in ordinary dissection nothing is seen of the ganglia proper, the dense connective-tissue capsule which covers them concealing their actual shape completely. The outlines of this capsule are indicated by the dotted lines on Plate 3, fig. 3. The form of the group so presented is a broad and flattened quadrilateral, with no indication of any division into right and left halves. The posterior border is slightly concave and is entirely free from the bulb, while the anterior one on the contrary is continuous with an overlapping fold of its ventral wall. The nerves from the lateral margin are connected at their bases by a web-like expansion of the capsule, which is prolonged out upon each of them as the nerve-sheath.

After the complex is removed from the animal, stained in paracarmine and cleared in glycerine, the actual flattened oval outline of the ganglia becomes visible, and it is seen that they are of much smaller dimensions than those shown by the external outline of the capsule, measuring but 1.5 mm. long and

3.0 mm. broad, while the apparent external dimensions reach a length of 3.0 mm. and a breadth of fully 5.5 mm. The ganglia are closely united by a very short and broad buccal commissure.

Buccal nerves.—From the buccal ganglia are given off three paired nerves and a single unpaired median one.

The anterior unpaired nerve (Plate 3, fig. 3, *b1.*) is completely concealed from view by the capsule. Though apparently a single unpaired nerve, it actually arises by a root from each ganglion, close in front of the commissure upon the dorsal surface. These separate roots at once fuse into a single median trunk which almost immediately bifurcates into two equal rami, that pass upward into the ventral wall of the bulb. Each gives off several delicate branches to the superficial wall-muscles, and then penetrates upward and outward to the rotella, to which each is distributed in a number of branches. Upon the dorsal surface of the first nerve, immediately before its bifurcation, a pair of very delicate branches, *b 1a*, are given off, which are distributed to the superficial muscles of the floor of the bulb immediately in front of the buccal ganglion. These are also shown in dorsal view in Plate 3, fig. 4, *1a*.

The paired nerves from the buccal ganglia in *Dolabella agassizi* appear upon their exit from the capsule as six independent nerves, corresponding to the number given by Amaudrut (1886). This is at some distance from the actual ganglia however, and in a cleared preparation the real origin of these nerves may be traced back to the ganglia proper, and the apparent number becomes reduced to but three main nerve-trunks upon each side. These nerves are numbered in sequence in Plate 3, fig. 3 as *b 2*, *b 3*, and *b 4*, *b 1* being the single median trunk just described.

The second buccal nerve, *b 2*, arises from the outer lateral margin of either ganglion. It bifurcates at a short distance, giving rise to a posterior ramus, *c–b, con*, which courses around the bulb dorsally and unites with the cerebral ganglia, forming the cerebro-buccal connective (Plate 2, *c–b. con.*). The anterior ramus of the second buccal nerve divides at once into two branches, *2c* and *2d*. The branch *2d* enters the large protractor bulbi muscle at its insertion into the pharyngeal bulb and gives off a number of fine branches to it, the main nerve passing on forward into the ventro-lateral muscles of the anterior portion of the bulb itself, a slender branch being continued forward and distributed to the anterior ventral protractor muscles of the bulb at their insertion into the latter. The branch *2c* passes obliquely forward and upward to the lateral wall, above the insertion of the lateral protractor bulbi muscle, giving off several

fine nerves to the superficial muscles of the bulb in this region, penetrates below the surface and continues forward to the ventral part of the anterior end of the bulb, ramifying there to it and to the mouth-tube.

The third buccal nerve, *b 3*, arises very close behind the second nerve and passes upward, parallel to the proximal portion of the salivary gland. It gives off a delicate branch to the superficial circular muscles of the posterior portion of the bulb, and to the duct of the salivary gland, and then divides into two main rami, the anterior one of which passes forward and upward to the superficial dorsal muscles of the bulb, while the posterior one passes dorsally and ramifies in the thin dorsal wall of the bulb directly beneath the cerebral ganglia.

The fourth buccal nerve, *b4*, arises from the outer posterior margin of the buccal ganglion, and bifurcates into two equal rami before emerging from the capsule. The more anterior of these, *4a*, curves upward along the inner margin of the salivary gland, which it closely follows to the entrance of its duct into the bulb, giving off numerous fine branches to the duct, and to the dorsal wall of the anterior end of the oesophagus, below the cerebral ganglion complex. The posterior ramus, *4b*, passes backward along the oesophageal wall, giving off a delicate branch to the salivary gland, and another to the anterior portion of the tube; the main trunk continuing along the side of the oesophagus throughout its whole extent, sending off numerous branches to it at intervals, which, anastomosing with those of its fellow of the opposite side, form a rich plexus in the oesophageal wall. Reaching the ingluvies the two trunks are prolonged over its wall to its junction with the thick-walled triturating gastric division. Here there is found a ring of nervous tissue surrounding the whole canal, in which the two nerves merge. From this nerve-ring numerous delicate nerves are given off to the gastric wall, forming a rich plexus, while four larger nerves approximately equidistant from each other, pass backward along the wall of the first triturating stomach. Beyond the posterior boundary of the first triturating division, branches are given off laterally from each of these, which anastomose mutually and form a second more irregular nerve-ring in the anterior wall of the second triturating stomach. From this second ring numerous nerves pass backward throughout the whole length of the intestine, giving off abundant irregular branches to its wall, which unite in extensive plexuses. A stronger laterally placed trunk on either side, while often obscure, still may usually be made out, as an indication of the primitive bilateral arrangement of the nerve distribution.

Parieto-visceral ganglia.—The parieto-visceral ganglion complex is situated

midway of the body-length at the posterior end of the anterior division of the body-cavity, being placed nearly transversely above the aorta, and immediately behind the anterior border of the liver, in front of and above the oblique body-septum, or diaphragm. Externally it is located by the anterior ends of the parapodia, being situated just below them and slightly to the right of the median line. The complex is of an elongated elliptical form, its double nature being indicated by the entrance of the connectives from the pleural ganglia, but no other external sign of its composition is evident. The left visceral ganglion is placed in front of the right parietal one, the larger and more conspicuous nerves emerging from the left end and doubling immediately around the aorta and to the rear. The two moieties are connected with the corresponding pleural ganglia of the central nervous system by long connectives, the right parietal ganglion to the right pleural one by the pleuro-visceral connective, Plate 2, fig. 1, *pl.-par. con*, the left visceral division to the left pleural ganglion by the pleuro-visceral connective, Plate 2, fig. 1, *pl.-v. con*. In addition to the figure just cited the complex appears in Plate 3, fig. 2, Plate 4, fig. 1, and Plate 5, fig. 4.

Visceral nerves.—From the left visceral ganglion two nerves arise. The first of these (Plate 3, fig. 2, *v 1*) is given off from the inner posterior end of the complex. It soon bifurcates into a more slender ramus which passes forward to the peritoneum of the dorsal body-wall, and a stronger one which is distributed to the vesicle of Swammerdam or spermatotheca, and its duct. The second visceral nerve arises as a very strong trunk from the posterior end of the ganglion (Plate 3, fig. 2, *v 2*, Plate 5, fig. 4). It at once divides into two equal rami, doubling around below the aorta and to the right, and diverging as they pass obliquely backward. The right one of these (Plate 5, fig. 4, *v. 2a*) crosses obliquely backward below the loops of the large hermaphroditic duct. Its distribution is best shown on Plate 3, fig. 2. It divides into two nearly equal trunks, one of which, *2b*, at once bifurcates into nearly equal branches, which pass backward and are distributed, the one to the rectum and the adjacent peritoneum, the other to the siphon and the peritoneum immediately surrounding it. The second trunk, *2c*, sends a branch, *2d*, to the peritoneum, and several minor ones to ramify among the tubules of the organ of Bohadsch, the extent of which is indicated by the dotted line, *o. B.* The remainder of the nerve curves forward and anastomoses with a branch of the seventh pedal nerve *7b*.

The left one of the two rami (Plate 3, fig. 2, *v 2b*, Plate 5, fig. 4, *v 2b*) of the second visceral nerve diverges backward from its fellow and sends off a

delicate branch to the peritoneum, another, *2b1*, branching to the distal end of the large hermaphroditic duct and to the peritoneum of the vesicle of Swammerdam, and then bifurcates equally. One of the branches thus formed, *2b4*, curves to the left and upward around the anterior border of the adnexed genital mass and penetrates the dorsal body-wall above the latter. Here it gives off slender branches to the vesicle of Swammerdam and to the peritoneum. The main trunk penetrates among the muscles forming the floor of the pericardial cavity, courses obliquely backward to its posterior wall, in which it again ascends to recurve obliquely to the right in the roof of the pericardium. It innervates the floor of the pericardium, the anterior end of the *crista aortae*, the beginning of the auricle, the roof of the pericardium, the reno-pericardial opening and its tube, and the kidney. The other branch, or genital nerve, *2b3*, passes directly backward and across the base of the adnexed genital mass to the genital ganglion group, *g. g.* This latter complex is shown on Plate 5 in fig. 4, *g. g*, and in more detail on a larger scale in fig. 1 of the same Plate. Here the delicate connective-tissue investment of the distal end of the small hermaphroditic duct has been dissected away, exposing the whole group of genital ganglia. Two of these, *g1* and *g2*, are fairly conspicuous (Plate 5, fig. 4), but the remaining ones, *g3* and *g4*, require careful dissection under high magnification for their detection. The genital nerve, *g. n*, the branch of the second visceral nerve just described, terminates in the largest of these genital ganglia, *g1*, from which the nerves, *a*, pass into the adjacent dorsal peritoneum, and the nerve, *b*, is sent to the small hermaphroditic duct. The remaining ganglia, *g2*, *g3*, and *g4*, are connected with *g1* in a complicated plexus from parts of which the nerves, *c*, pass on to the small hermaphroditic duct and the ovotestis, while the fine branches *d*, together with other still finer ones not figured, penetrate the adnexed genital mass.

Figure 1 of Plate 3 illustrates the parieto-visceral complex of *Tethys cervina*, as described by the writer (1909). It is here introduced to call attention to the homologies existing between this representative of the Aplysiinae and *Dolabella agassizi*. Comparing this with Plate 3, fig. 2 it is seen that the two visceral nerves in Dolabella represent the four shown in *Tethys cervina*, the second one in Dolabella being formed by the union of the second, third, and fourth of Tethys. Identical relations in the visceral innervation of the organ of Bohadsch and in the anastomosis of a branch of the second visceral with a pedal nerve are also evident, so that the double innervation of this organ from both visceral and pedal ganglia obtains in this subdivision of the family Aplysiidae, as well as in the more restricted Aplysiinae.

Parietal nerves.—The first parietal, or vulvar nerve (Plate 3, fig. 2, *p. 1*) arises from the ventral surface at the left or posterior end of the ganglion. It emerges from the capsule between the two ganglionic components of the parieto-visceral group, but slightly nearer the parietal one, into which it can be traced. It passes backward in the connective-tissue attached to the aorta (Plate 4, fig. 1, *p. 1*) to the dorsal body-wall, and thence directly to the anterior end and external opening of the large hermaphroditic duct. It gives off a branch laterally, which curves to the right and forward, uniting with the branch 7*a* from the seventh pedal nerve, which is distributed to the organ of Bohadsch, which relation is the same as that found in *Tethys cervina* (Plate 3, fig. 1), the pedal nerve in that instance being the third in serial order.

From the posterior end of the right parietal ganglion arises a single strong nerve, the second parietal, or osphradio-ctenidial nerve. Its general relations are shown in Plate 3, fig. 2, *p2*, and the detail of its ramification in Plate 4, fig. 1, *p2*. It curves backward along the left border of the aorta, crosses above it, and opposite the middle of the V-shaped heart penetrates the dorsal peritoneum, giving off the following branches:— Plate 4, fig. 1, *1*, a slender nerve to the peritoneum, *2*, a nerve which passes directly forward near the median line below the spermatic furrow, to which it ramifies, also sending off the branch *2a*, which fuses with a branch of the 7th pedal nerve, *7p*. The main trunk is markedly thickened near the origin of these branches, and bifurcates into the nearly equal divisions *3* and *4*. The ramus *3* forks into *5* and *6*, the first passing to the anterior portion of the mantle, the second to the outer face of the kidney, giving off the branch *7* to the ventral face of the same organ. The ramus *4* thickens decidedly, though no well-marked ganglion is formed, and gives off the branches *8* and *9* to the walls of the venous sinus at the base of the heart and to the mantle, and also numerous delicate short twigs which pass through the integument to the osphradium, at the anterior end of the ctenidium, indicated in the figure cited by the outline *osp*. Beyond the thickened portion the main nerve gives off the branch *10*, which ramifies to the roof of the branchial chamber above the ctenidium, and to the walls of the branchial sinus at its base. The main nerve-trunk *11*, now enters the ctenidium and continues as its chief ctenidial nerve, *ct. n*, along the greater curvature to its tip, giving off numerous lateral branches to its different divisions. Other than the smoothly outlined thickening indicated above there is no trace of a distinct osphradial or ctenidial ganglion.

Respiratory, Circulatory, and Excretory Systems.— The external

features of the respiratory system have already been given under the general discussion of the pallial organs.

The circulatory and excretory organs seem to be of the general type common to the Aplysiidae and present no characters so fundamentally different as to warrant a detailed discussion here.

LITERATURE.

Adams, A., and Reeve, L.

1848. The zoology of the voyage of H. M. S. Samarang. Mollusca. London, 10, 87 pp., 24 pls.

Adams, H., and A.

1853–1858. The genera of recent Mollusca; arranged according to their organization. London, 3 vols.

Amaudrut, A.

1886. Le système nerveux de la *Dolabella rumphii*. Bull. Soc. philom., ser. 7, **10**, p. 68–74.

Angas, G. F.

1867. A list of species of marine Mollusca found in Port Jackson Harbour, New South Wales, and on the adjacent coasts, with notes on their habits, &c. Proc. Zool. soc. London, 1867, p. 185–233, 912–935.

Barbut, James.

1783–1788. The genera Vermium. London, 2 parts.

Bergh, Rudolph.

1905. Die Opisthobranchiata der Siboga-expedition. Result. explor. Siboga. Monogr. 50, 248 pp., 20 pls.

1907. The Opisthobranchiata of South Africa. Trans. South African philos. soc. **17**, pt. 1, p. 1–144, pl. 1–14.

Blainville, H. M. D. de.

1816–1839. Dictionnaire des sciences naturelles. Paris and Strasbourg, 61 tom.

1825–1827. Manuel de malacologie et conchologie. Paris and Strasbourg, 2 tom.

Brazier, John.

1876–1879. [Mollusca of the Chevert expedition]. Proc. Linn. soc. New South Wales, 1–3.

Brueck, A.

1913. Ueber die muskelstruktur und ihre entstehung, sowie ueber die verbindung der muskeln mit der schale bei den muscheln. Zool. anz., **42**, p. 7–18.

Clessin, S.

1899. Die familie der Aplysiidae. Martini and Chemnitz Systematisches conchylien-cabinet, Ed. Küster and Kobelt, **1**, 8, p. 1–58, pl. 1–14.

Cuvier, G.

1804. Mémoire sur la dolabelle, sur la testacelle, et sur un nouveau genre de mollusques à coquille cachée nommée parmacelle. Ann. Mus. hist. nat., **5**, p. 435–444, pl. 29.

Deshayes, G. P.

1863. Catalogue des mollusques de l'Ile de la Réunion (Bourbon). Paris, 4, 144 pp., 14 pls.

Ehrenberg, C. G.

1828. Symbolae physicae. Invertebrata. Berlin.

Eliot, C.

1899. Notes on tectibranchs and naked mollusks from Samoa. Proc. Acad. nat. sci., Phila., 1899, p. 512–423, pl. 19.

Farran, G. P.

1905. Report on the opisthobranchiate Mollusca collected by Professor Herdman, at Ceylon, in 1902. Rept. Ceylon pearl oyster fisheries, pt. 3, p. 329–364, pl. 1–6.

Gilchrist, J. D. F.
1894. The pallial complex of Dolabella. Proc. Royal soc. Edinb., **20**, p. 261.
Gray, Maria Emma.
1842–1859. Figures of molluscous animals selected from various authors. London, 5 vols.
Hasselt, J. C. van.
1824. [Mollusques de Java]. Bull. sci. nat. et de géol., **3**.
Heath, Harold.
1911. The solenogastres. Mem. M. C. Z., **45**, p. 1–180, 40 pls.
Hedley, Charles.
1910. Catalogue of the marine Mollusca of Queensland. 12th rept. Austral. assoc. adv. sci., p. 343–371.
von Ihering, Hermann.
1877. Vergleichende anatomie des nervensystemes und phylogenie der mollusken. Leipzig, 10, 290 pp., 8 pls.
Krauss, C. F. F.
1848. Die Südafrikanischen mollusken. Stuttgart, [4], 140 pp., 6 pls.
Lacaze-Duthiers, F. J. H. de.
1898. Les ganglions dits palléaux et le stomato-gastrique de quelques gastéropodes. Arch. zool. expér et gén., sér. 3, **6**, p. 331–428, pl. 24–27.
Lamarck, J. B.
1801. Système des animaux sans vertèbres. Paris, 8, 432 pp.
1835–1845. Histoire naturelle des animaux sans vertèbres. Ed. Deshayes and Milne Edwards. Paris, 11 tom.
Lesson, R. P.
1826–1839. Voyage autour du monde. . . . sur. . . . La Coquille. Zoologie. Paris, 2 tom.
Linné, Carl.
1788–1793. Systema naturae, Ed. 13. J. F. Gmelin. Lipsiae, 3 tom. and atlas.
MacFarland, F. M.
1909. The opisthobranchiate Mollusca of the Branner-Agassiz expedition to Brazil. Leland Stanford Junior univ. publ., univ. ser. no. 2, 104 pp., 19 pls.
von Martens, E.
1880. Mollusken. Moebius's Beitr. meeresfauna Mauritius u. Seychellen, p. 181–352, pl. 19–22.
Martyn, Thomas.
1784–1787. The universal conchologist. London, 4 vols.
Mazzarelli, G. F.
1890. Ricerche sulla glandola del Bohadsch nelle Aplysiidae (*glandola opalina* del Vayssière). Boll. Soc. nat. Napoli, ser. 1, **4**, p. 29–33.
1890. Ricerche sulla morfologia e fisiologia della glandola del Bohadsch (*glandola opalina* del Vayssière) nelle Aplysiidae e diagnosi di una nuova specie di Aplysia. Atti R. accad. sci. fis. mat., append. 1, ser. 2a, **4**, no. 1, p. 1–26, tav. 1–2.
1893. Monografia delle Aplysiidae del Golfo di Napoli. Mem. Soc. Ital. sci., (detta dei XL), ser. 3a, **9**, no. 4, p. 1–222, tav. 1–13.
Mazzarelli, G. F., e Zuccardi, R.
1889. Su di alcun Aplysidae dell'Oceano Pacifico, appartenenti alla collezione Chierchia. Boll. Soc. nat. Napoli, ser. 1, **3**, p. 47–54.
1890. Sulle Aplysiidae raccolte dal Tenente di vascello Gaetano Chierchia nel viaggio della Vettor Pisani (1882–1885). Mem. Soc. Ital. sci., (detta dei XL), ser. 3, **8**, no. 2, p. 1–21, tav. 1–2.

Pease, W. H.

1860. Descriptions of new species of Mollusca from the Sandwich Islands. Proc. Zool. soc. London, p. 18–36.

Pilsbry, H. A.

1895–1896. Tryon's Manual of conchology, **16.**

Quoy, J. R. C., et Gaimard, J. P.

1826–1834. Voyage de l'Astrolabe. Zoologie. Paris, 4 vols.

Rang, Sander.

1828. Histoire naturelle des aplysiens. Paris, **7,** 83 pp., 25 pls.

Reeve, L., and Sowerby, G. B.

1843–1878. Conchologia Iconica; or, illustrations of the shells of molluscous animals. London, 20 vols.

Rumpf, G. E.

1705. D'Amboinsche rariteitkamer. Amsterdam, [28], 340, [43], pp., 61 pls.

1711. Thesaurus imaginum Piscium Testaceorum. Lugduni Batavorum.

Smith, E. A.

1884. Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H. M. S. Alert 1881–2. Mollusca, p. 34–116, 487–508, pl. 4–7, 44.

Stearns, R. E. C.

1879. Description of a new species of Dolabella, from the Gulf of California, with remarks on other rare or little-known species from the same region. Proc. Acad. nat. sci. Phila., p. 395–401, pl. 7.

1893. On rare or little known mollusks from the west coast of North and South America, with descriptions of new species. Proc. U. S. N. M., **16,** p. 341–352, pl. 50.

1894. The shells of the Tres Marias and other localities along the shores of Lower California and the Gulf of California. Proc. U. S. N. M., **17,** p. 139–204.

Vayssière, A.

1885. Recherches zoologiques et anatomiques sur les mollusques opisthobranches du Golfe de Marseille. I. Tectibranches. Ann. Mus. hist. nat. Marseille. Zool., **2,** 181 pp., 6 pls.

1906. Recherches zoologiques et anatomiques sur les opisthobranches de la Mer Rouge et du Golfe d'Aden. I. Les Tectibranches. Ann. Faculté sci. Marseille, **16,** p. 19–90, pl. 1–4.

Zuccardi, Raffaele.

1890. Ricerche anatomiche sull' apparato digerente delle Aplysiae del Golfo di Napoli. Boll. Soc. nat. Napoli, ser. 1, **4,** p. 5–14, tav. 1–2.

EXPLANATION OF THE PLATES.

PLATE 1.

PLATE 1.

Fig. 1. Dolabella agassizi, sp. nov.

Fig. 1. Dorsal view, from a water-color drawing made by Alexander Agassiz from the living animal, at Easter Island. The scale of the drawing was not indicated, but it is approximately three fourths the size of the preserved specimen.

PLATE 2.

PLATE 2.

Fig. 1. Dolabella agassizi, sp. nov.

Fig. 1. The central nervous system in dorsal view. The connective-tissue capsules and sheaths of the ganglia and nerves have been dissected away, and are not represented in the drawing. The cerebral ganglia are shown in the upper part of the Plate, their nerves being indicated on the right side only by *c 1*, *c 2*, etc., the homologous nerves of the left side being symmetrically located and easily recognizable; *c-b con*, the cerebro-buccal connectives passing to the buccal ganglia (Plate **3**, fig. 3); *c-p con*, and *c-pl. con*, the cerebro-pedal and cerebro-pleural connectives, joining the cerebral to the pedal and pleural ganglia respectively, and shown on the lower half of the plate. Owing to the great length of these connectives their full extent is not represented, the interruption being indicated by the dotted portions. The pedal nerves are numbered serially in the order of their appearance from the ganglia, from in front backward; *pl. 1* and *pl. 2*, the first and second nerves from the pleural ganglia; *pl-par. c*, the pleuro-parietal connective of the right side; *pl-v. con*, the pleuro-visceral connective on the left. × 10.

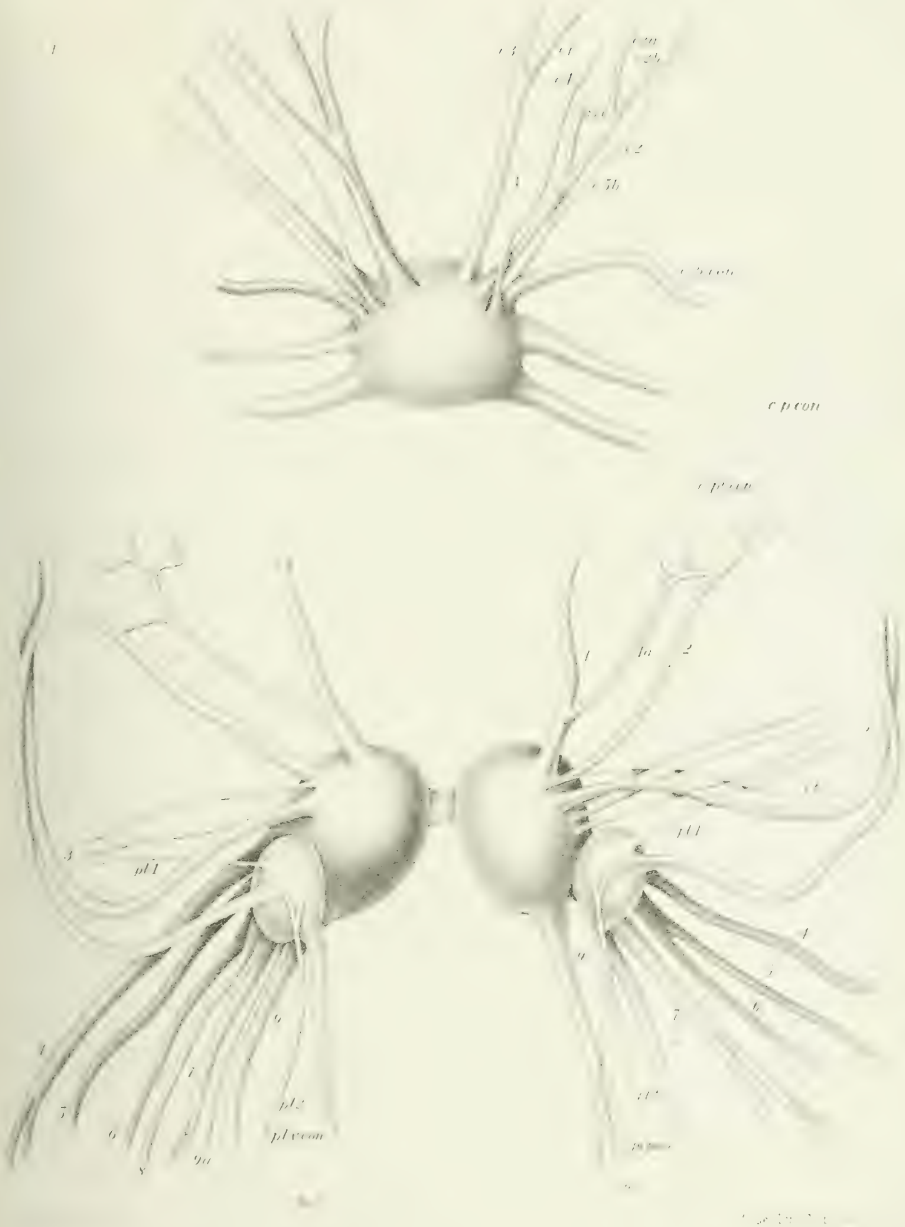

c.p.com
pl.com
pl.com

PLATE 3.

PLATE 3.

Fig. 1. Tethys cervina Dall and Simpson.

Fig. 1. Semidiagrammatic representation of the parieto-visceral ganglion complex as seen from below. The contour of the organ of Bohadsch is represented by the dotted line, *o B*. The anterior end of the animal is directed toward the upper margin of the Plate, the right side corresponding to the left one of the figure; *pl-par. c*, pleuro-parietal connective; *pl-v. c*, pleuro-visceral connective; *p. g*, right parietal ganglion; *v. g*, left visceral ganglion; *p1*, first parietal nerve, its branch *1 a* anastomosing with the branch *3 f* of the third pedal nerve, *3 ped*, its branch *1 b* forming the vulvar nerve; *p 2*, second parietal, or osphradio-ctenidial nerve; *osp. g*, the osphradium and its ganglion, the fine terminal nerves passing to the ctenidium; *v. 1*, first visceral nerve, to the spermatotheca and its duct; *v. 2*, the second visceral nerve, *2 a*, its hepatic branch, *2 b*, its main ramus, forking to the rectum, *r*, and siphon, *s*, and the adjacent peritoneum; *2 c*, its recurrent branch to the organ of Bohadsch and anastomosing with *3 b*, the branch of the third pedal nerve, *3 ped*, to the same organ; *v 3*, the third visceral nerve, supplying the genital ganglion, *g.g*, and the reproductive tract; *v. 4*, the fourth visceral nerve, branching into *4 a*, to the ventricle, *v*, and the pericardium, *p c*, and *4 b*, to the auricle and pericardium, *au. pc*, and to the kidney, *k*.

Fig. 2–4. Dolabella agassizi, sp. nov.

Fig. 2. A similar representation of the parieto-visceral ganglion complex. The abbreviations used in Fig. 1 apply to this figure except that the second, third, and fourth visceral nerves arise by a single trunk, *v. 2*, which bifurcates into *v. 2 a* and *v. 2 b*; *v. 2 a* has relations similar to *v. 2* of the preceding figure, save that its recurrent branch to the organ of Bohadsch forms an anastomosis with a branch of the seventh, *7 ped*, instead of the third pedal nerve; *v. 2 b* gives off a branch, *2 b 1*, to the peritoneum of the spermatotheca, another, *2 b 3*, to the genital ganglion complex, corresponding to the third visceral nerve, *v. 3*, of the preceding figure, while the remainder, *2 b 4*, representing the fourth visceral nerve, *v. 4* of Fig. 1, is like it distributed to the heart, pericardium, and kidney.

Fig. 3. Buccal ganglion complex as seen in dorsal view, *i. e.* the face in contact with the pharyngeal bulb. The outline of the connective-tissue sheaths of the ganglia and nerves is indicated by the dotted lines. The nerves are numbered serially *b. 1* to *b. 4*, and are described fully in the text. The second nerve gives off a branch, *c-b. con*, which passes around the pharyngeal bulb to the dorsal side and unites with the cerebral ganglia as the cerebro-buccal connective, (*c-b. con*, Plate **2**, fig. 1); *b 1 a*, superficial branches of the first buccal nerve, *b 1*, shown in detail from the ventral surface in fig. 4. × 8.

Fig. 4. Ventral surface of the first buccal nerve, *b 1*, showing the origin of its superficial branches, *1 a*. × 8.

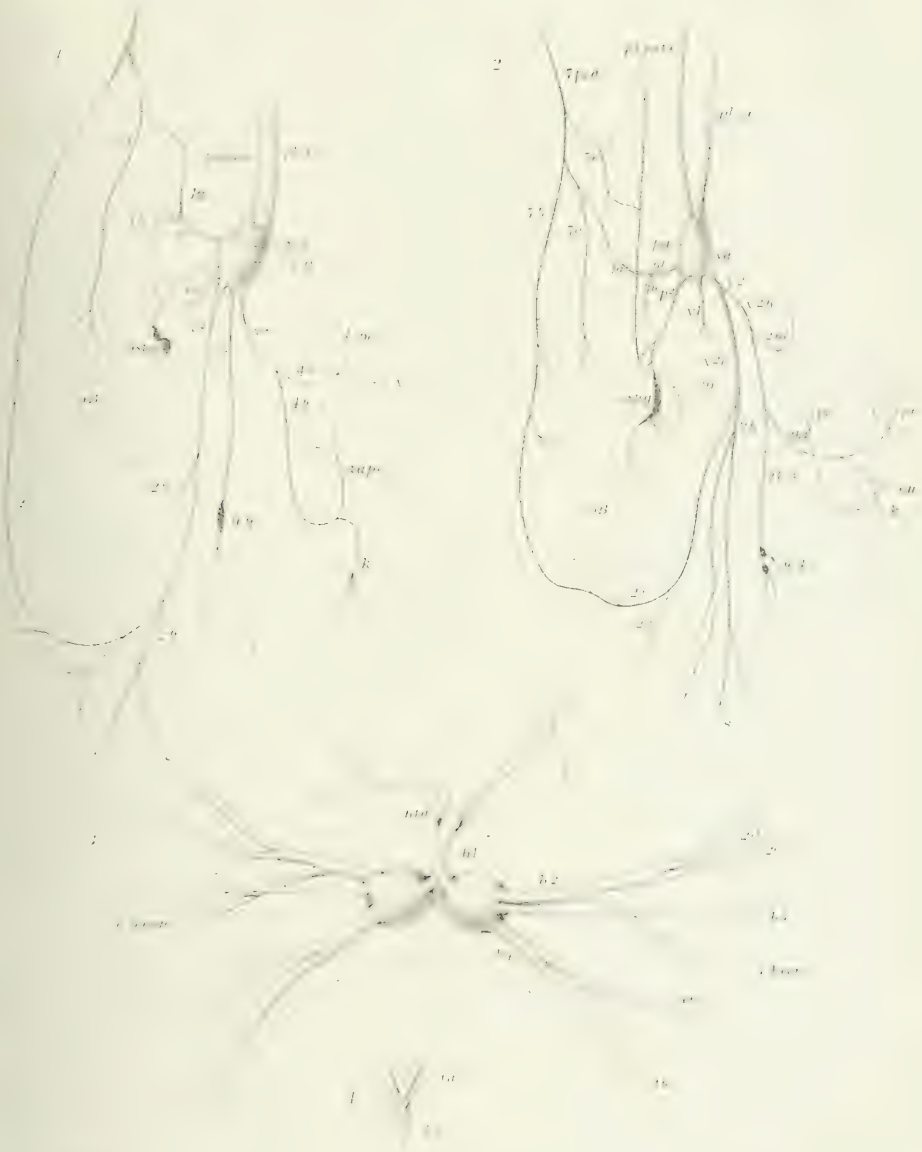


PLATE 4.

PLATE 4.

Fig. 1–3. Dolabella agassizi, sp. nov.

Fig. 1. Detail of the distribution of the osphradio-ctenidial nerve as seen from below; *au*, auricle; *v*, ventricle; *c. a*, crista aortae; *ao*, aorta; *v. a*, visceral artery; *g. a*, gastric artery; *g*, genital artery; *p. b*, dotted line indicating the boundary of the pericardium; *o. B*, dotted line indicating the boundary of the organ of Bohadsch; *s. b*, dotted line indicating the boundary of the shell; *r-p. o*, reno-pericardial opening. The parieto-visceral ganglion complex lies above the main aortic trunk at the top of the figure, the left visceral ganglionic moiety lying in front of the right parietal portion. At their left anterior ends they are joined by their respective connectives from the pleural ganglia (Plate **2**, fig. 1, *pl-v. con*, *pl-par. con*); *v. 2*, the second visceral nerve, branching at once into *v. 2a* and *v. 2b*, which are distributed (Plate **3**, fig. 2); *p. 1*, first parietal, or vulvar nerve; *p. 2*, second parietal, or osphradio-ctenidial nerve. The main branches of this nerve are numbered in series; *1* to peritoneum; *2* to the middorsal peritoneum and the integument forward, giving off a branch *2a*, which anastomoses with a twig from the seventh pedal nerve, *7 p*. The branch *3* bifurcates into 5 and 6, the first passing to the anterior portion of the mantle, while the second passes to the outer face of the kidney, giving off the branch *7* to its ventral face on the way. The main trunk, *4*, now thickens decidedly and gives off *8* and *9* to the venous sinus at the base of the heart and to the mantle. Numerous minute short branches pass to the osphradium, *osp.*, shown here in outline. The branch *10* ramifies to the wall of the branchial chamber above the ctenidium, and to the walls of the branchial sinus at its base. The main trunk, *11*, now enters the ctenidium, *ct.*, shown here in outline, and continues as the chief ctenidial nerve *ct. n*, to its tip, giving off numerous fine branches on the way. No distinct osphradial nor branchial ganglia other than represented in the thickened nerve-trunk itself are to be found. × 2.

Fig. 2. Ventral view of shell. × 1.7.

Fig. 3. Detail of common genital opening. The anterior end is directed toward the upper side of the figure; *a*, the integumental fold continued forward from the region of the siphon, as shown at *g*, (Plate **6**, fig. 1), along the floor of the pallial cavity and forming the dorsal margin of the genital opening. From its anterior curvature the dorsal or left ridge, *l*, of the genital furrow extends forward, approaching its fellow, *r*, of the right side, which is a continuation of the incomplete septum partially dividing the common genital opening into a dorsal and a ventral portion. × 3.

1
2
3
v2
2
p2
ao
v2a
p1
v2b
7p
2a
gf
osp
ctu
ct
oli
va
ca
v
au
pb
rpo
sb
l
r
a

PLATE 5.

PLATE 5.

Fig. 1–5. Dolabella agassizi, sp. nov.

Fig. 1. Genital ganglion complex; *gn*, the genital nerve from the visceral ganglion (Plate 3, fig. 2, *2 b 3*), terminating in a group of ganglia at the right margin of the adnexed genital mass (*cf.* Plate 5, fig. 4, *g.g.*); *a*, fine nerves to dorsal peritoneum; *b*, nerves ramifying to the small hermaphroditic duct; *c*, nerves to the small hermaphroditic duct and to the ovotestis; *d*, nerves to the adnexed genital mass. × 50.

Fig. 2. Ventral view of central nervous system to show the relations of the parapedal commissure; *ao*, aorta; *s-b. a*, subbulbar artery; *l. p. a*, left pedal artery; *r. p. a*, right pedal artery; *p-p. c*, parapedal commissure, connecting the two pedal ganglia, shown above the aorta; *a* and *b*, paired nerves arising from the parapedal commissure; *d*, *f*, branches to diaphragm; *h*, branch to peritoneum; *c*, the unpaired median nerve from the same source; *1–9*, pedal nerves in ventral view. × 5.

Fig. 3. The four innermost lateral teeth of the thirtieth row of the radula seen obliquely from above. The teeth are numbered from within outward. The hook of the fourth tooth is double and the tip of the base of the same is also bifid (*cf.* Plate 5, fig. 5). × 100.

Fig. 4. Reproductive system as seen from below, the parts lying in their natural relations; *sm. h. d*, the small hermaphroditic duct, its free end, *ov*, arising in the ovotestis, which is not represented, the closely convoluted turns of the duct narrowing on reaching the right posterior angle of the adnexed genital mass, *a. g. m.* It passes diagonally forward across the ventral face of the latter, forms a loop upon its dorsal surface and returns ventrally as *sm. h. d'*, to open into the fertilization-chamber, *f. c.*; *c. d*, copulatory duct opening into the fertilization-chamber and receiving the long duct of Cuvier, *d. C.*, from the spermatocyst, *sp. c.* Into the fertilization-chamber also open the convoluted portion of the nidamental gland dimly seen in the anterior part of the concave face, and the albumen gland, not visible in this view; *ov-sp. d*, the ovospermatic duct, the continuation of the spiral portion of the nidamental gland into the large hermaphroditic duct, *l. h. d*; *r. s*, its blind sac-like diverticulum, the seminal receptacle, near the distal end; *sp. th*, the spermatotheca, or vesicle of Swammerdam, opening by its long slender duct, into the distal end of the large hermaphroditic duct; *i*, edge of a small flap of integument cut from the body-wall, through which the large hermaphroditic duct opens in the common genital orifice; *pl. v. con*, the left pleuro-visceral connective; *pl. par. con*, the right pleuro-parietal connective; *l. v. g*, left visceral ganglion; *r. p. g*, right parietal ganglion; *v. 1*, first visceral nerve to spermatotheca; *v. 2a*, right main branch of second visceral nerve, its branch *v. 2a'*, to the organ of Bohadsch etc., and *v. 2a''* forking to rectum and anus; *p. 1*, first parietal nerve to vulvar region; *p. 2*, second parietal, or osphradio-ctenidial nerve; *v. 2b*, left main branch of second visceral nerve, ramifying to the genital ganglia, *g. g.*, and to the heart, pericardium, kidney, etc. × 1.5.

Fig. 5. Four innermost teeth of the fifty sixth row of the radula, corresponding in position to those shown in Fig. 3. The same double characteristics appear in the fourth tooth that were found in the preceding row, shown in Fig. 3, and in all the intervening ones. × 100.

d
1
gn
q 4
q 3
q 2
q 1
a
b
c
2
sbd
la
pl v.con
pl 2
pl parcon
rpa
9a
f
d
lpa
aa
3
4
pl. v.con
pl parcon
lxg
rp q
vl
pl
pl2
v2b
v2a
spth
thd
vs
spc
d C
sm.h
d'
v2a
v2a
qq
a q m
fc
vd
ov.spd
sm.hd
ov
5
1
2
3
4

PLATE 6.

PLATE 6.

Fig. 1–9. Dolabella agassizi, sp. nov.

Fig. 1. Diagram showing the relations of the pallial organs; *a*, inner boundary of base of parapodia; *b*, projection of outline of posterior body-disc upon underlying organs; *k*, similar projection of the upper margin of parapodia, continuous in front as a low ridge; *c*, outline of boundary of shell; *d*, right margin of mantle, extending from between the anterior ends of the parapodial lobes backward, its posterior margin reflexed dorsally at *e*, thence continued transversely and rising into the siphon margin at *s*; at the posterior edge of the siphon base it becomes nearly indistinguishable, but may be followed as a faint elevation to the right behind the anal opening, *f*, thence merging into a strong fold, *g*, which curves forward along the floor of the pallial chamber to the reproductive opening, *h*, where it is continued around as its front margin and disappears within it (*cf.* Plate 4, fig. 3); *i*, genital furrow, extending forward from the genital opening, *h*; *l*, margin of the shell-foramen; *n*, cushion-like prominence at bottom of siphon. Natural size.

Fig. 2. Typical lateral tooth from posterior region of radula in side view, *a-b*, base; *c*, tip of hook. × 100.

Fig. 3. Median tooth from 12th row of radula, in face view. No indication of a hook, it being worn away probably. × 175.

Fig. 4. Median tooth from 13th row of radula. × 175.

Fig. 5. Diagram of the pallial cavity; the mantle being cut away along the double line *m*, exposing the underlying ctenidium; *a*, outline of inner boundary of base of parapodia; *k*, projection of free upper margin of parapodia upon the underlying organs continuous in front beyond the pallial cavity; *b*, outline of projection of the margin of the posterior body-disc; *m*, cut edge of mantle, the incision being carried around close to the origin of the left attached margin of the mantle from the body-wall, thus laying open nearly the whole extent of the upper gill-cavity, except at the left posterior margin, where it reaches slightly farther back; *af*, afferent blood-vessel to ctenidium, *ef*, efferent blood-vessel to the same. That portion of the ctenidium lying to the right of a line joining *af* and *ef* projects freely into the pallial cavity, that to the left of the same is attached along its margin to the body-wall; *h*, common genital opening, its borders leading forward as the dotted lines to continue as the external spermatic groove, *i*, to the right side of the head; *s*, siphon; *c*, the cushion-like prominence at the base of the siphon, directly below the posterior rounded opening between the parapodia; *o*, osphradium. Natural size.

Fig. 6. Median tooth from 20th. row of radula in side view. A slight median hook present, but is worn; the anterior end of the thick basal portion is curved upward. × 175.

Fig. 7. Median tooth from 23rd. row of radula in face view. × 175.

Fig. 8. Median tooth from 31st. row of radula in side view. × 175.

Fig. 9. Median tooth from 59th. row of radula in side view. The hook here reaches its greatest development. × 175.

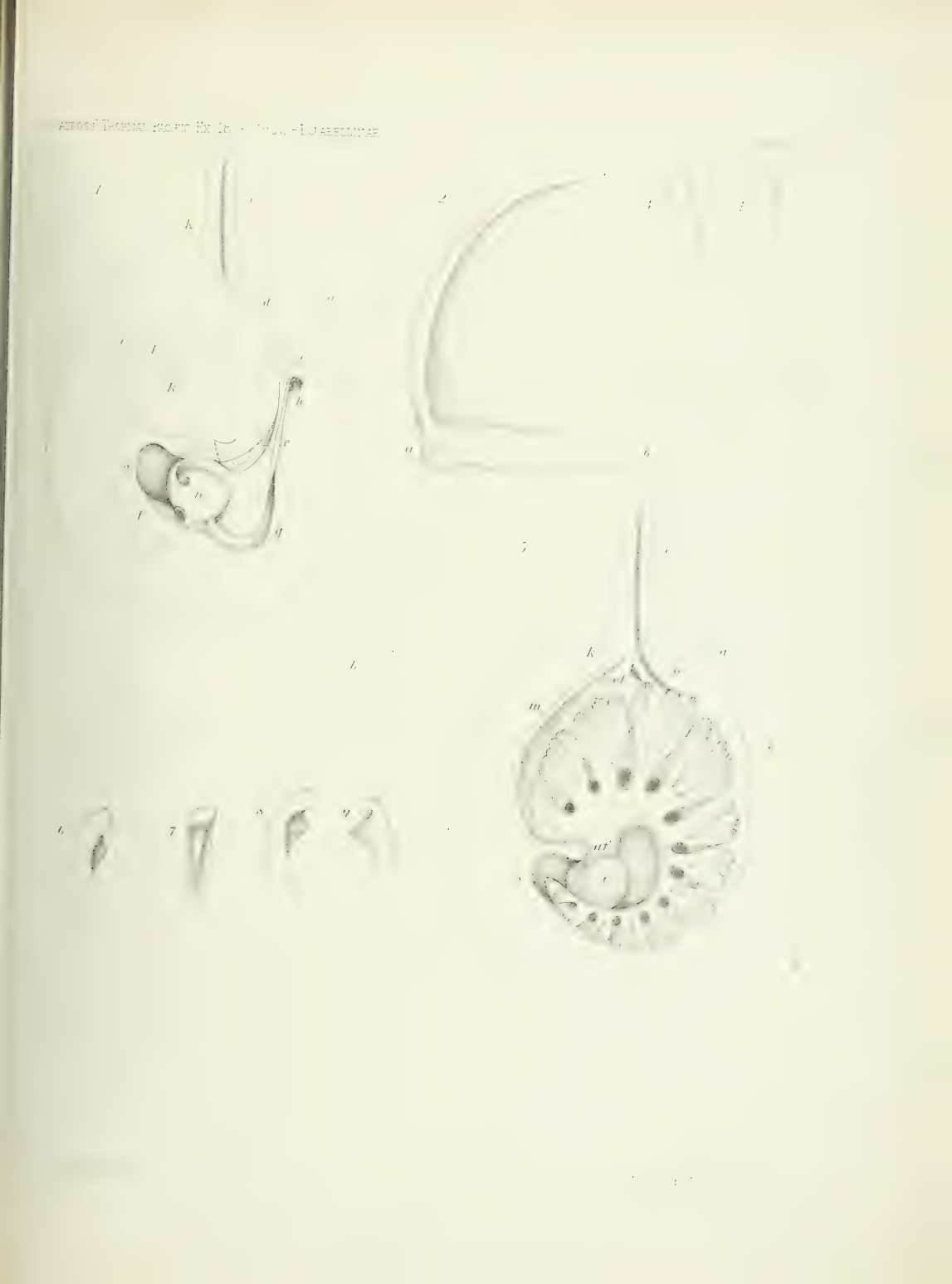


PLATE 7.

PLATE 7.

Fig. 1–4. Dolabella agassizi, sp. nov.

Fig. 1. Section transverse to long axis of mandible, about midway of its length (*cf.* Plate 8, fig. 5, *m.*); *a*, anterior or oldest border, the worn and broken rodlets borne on a thick basal cuticula, *b*; *c*, posterior or youngest border of the mandible, the short rodlets being formed in a deep sulcus upon the distal ends of the epithelium cells, and progressively increasing in length forward for about one half the width of the mandible; *d*, thick striated cuticle overlying the rodlets, secreted by the epithelium of the upper side of the sulcus; *e*, connective-tissue and muscle-fibres of the integument. × 22.

Fig. 2. Detail of innermost portion of mandibular sulcus; *a*, mandibular rodlets, cuticular differentiations upon the distal ends of the epithelium cells, *e*; *c*, epithelium of upper side of the sulcus which secretes the thick stratified cuticle, *d*, filling the space above the rodlets in the sulcus; *b*, muscle-fibres of the integument, many passing up through the basement-membrane and the compact layer of connective-tissue *f*, to terminate among the epithelial cells (*cf.* Plate 8, fig. 1 and 3). × 180.

Fig. 3. One of the longest of the mandibular rodlets, from the middle region of the mandible. The rodlet is still in contact with the epithelium-cell which produced it, and shows distinct stratification into layers as well as fainter longitudinal striation. × 180.

Fig. 4. A much shorter rodlet from a point toward the bottom of the sulcus, drawn at the same magnification as the preceding figure. The basal cell is proportionately much larger. × 180.

1
d
a
c
e
b
2
c
d
a
3
f
b
4
b
b

PLATE 8.

PLATE 8.

Fig. 1–3. Dolabella agassizi, sp. nov.

Fig. 1. A group of seven epithelial cells from the mandibular sulcus region. Only the basal portion *a*, of the cuticular rodlets is shown; *f*, basal stratum of connective-tissue; *b*, *b*, two groups of muscle-fibres, the freely branching ends of which penetrate the basement-membrane and ramify around the basal ends of the epithelium-cells. In order to follow these branchings the focus has been changed slightly in drawing. The longitudinal fibrillation of the cytoplasm of the epithelial cells appears to be continuous beyond their distal ends into the cuticle itself. Celloidin section, Mallory's connective-tissue stain. × 500.

Fig. 2. Large subepithelial gland-cell from near base of palatal flap. The epithelium is not represented, being stripped off from the basement-membrane, *d*; the nucleus of the cell does not lie in the plane of the section. The dilated proximal end of the cell shows clear reticular cytoplasm with deeply staining nodal points. The region *b* is filled with a homogeneous secretion, which exudes from the tip of the cell at *a*, and passes up between the epithelial cells to their free surface. × 500.

Fig. 3. Three epithelial cells from near the bottom of the mandibular sulcus; *a*, the short cuticular rodlets; *f*, the basal stratum of compact connective-tissue, through which pass the richly branched ends of two muscle-fibres, which terminate in it and between the basal ends of the epithelial cells *c*. Fig. 1 and 3 show that a considerable amount of shrinkage has taken place in the epithelium, which has rendered the termination of the muscle-fibres more evident. Hansen's iron hematoxylin and chromotrop 2B. × 500.

Fig. 4. Dolabella hasseltii (Férussac).

Fig. 4. Cross-section of the pharyngeal bulb, taken in the region of the mandibles to show their relations; *a*, outline of pharyngeal bulb; *c*, its lumen; *m*, mandibles, *g*, mandibular sulcus in which the rodlets are produced. The plane of this section is slightly posterior to the dotted line indicating the mandible *m*, in Fig. 5. × 12.

Fig. 5–7. Dolabella agassizi, sp. nov.

Fig. 5. Semidiagrammatic dorsal view of the interior of the pharyngeal bulb. The bulb has been opened by a median dorsal longitudinal incision, and the sides have been reflected; *m*, the mandibles; *l. f*, the palatal folds of the dorsal wall of the bulb, thickly set with the palatal spines; *f*, a transverse ridge in the dorsal wall connecting the palatal folds; *oe*, the oesophageal end of the bulb. The radula is seen in the centre of the organ, its anterior end buried in a deep curved groove. × 3.

Fig. 6. A group of the numerous subepithelial gland cells imbedded in the connective-tissue of the palatal flap, near the free margin. × 500.

Fig. 7. Surface view of a portion of the mandible near its posterior border; *a*, youngest rodlets; *b*, older ones. × 90.

PLATE 9.

PLATE 9.

Fig. 1–8. Dolabella agassizi, sp. nov.

Fig. 1. Single palatal spine, detached from the epithelium, but still imbedded in the common cuticula of the palatal flap. × 170.

Fig. 2. Early stage in the formation of a palatal spine. The spine here appears as a slightly thickened cap on the distal end of the granular basal cell. The thick common cuticula overlies all the epithelial cells of the figure, but is not here represented. × 175.

Fig. 3. Base of palatal spine, showing its relation to the basal matrix-cell, and to the general columnar epithelium. Part of another basal cell is shown at the left, its spine not being visible in the section. × 175.

Fig. 4. A later stage than that shown in the preceding figure, two layers of the young spine having been formed. × 175.

Fig. 5. A still later stage of the same, the section passing to one side of the nucleus of the basal matrix-cell. × 175.

Fig. 6. Later stage of the same process. The spine and basal cell have both increased in size. The cytoplasm of the matrix-cell contains numerous irregular vacuoles and is coarsely granular. × 175.

Fig. 7. Section across the long axis of the palatal fold as seen under low magnification; *a*, dorsal surface, forming part of the floor of the pharyngeal duct. The one-layered columnar epithelium *c*, bears a slight cuticula on the dorsal side, *a*, which thickens greatly on the ventral surface, *b*, and contains the palatal spines, differentiated in its substance, and resting upon the epithelium, or raised above it, and projecting freely; *c*, the free margin of the palatal fold; *d*, section of a salivary duct. × 18.

Fig. 8. Detail of fully formed palatal spine showing its relation to the epithelium and to the common thick striated cuticula, *c*, to the surface of which it does not yet extend, being still in contact with its matrix-cell, *b*. × 220.

PLATE 10.

PLATE 10.

Fig. 1–10. Dolabella agassizi, sp. nov.

Fig. 1. Outline of the gastric armature. The stomach has been slit lengthwise and opened out flat; *a*, posterior end of oesophagus; *b*, the slightly marked ingluvies; *c*, the first triturating stomach with the outlines of the bases of the gastric teeth; *d*, the second triturating stomach, larger and thinner walled than the preceding, the basal outlines of the very numerous but minute teeth not being apparent in this magnification.

Fig. 2. *a*, one of the medium sized gastric teeth seen in side view; *b*, the same from above, the four sided pyramidal form being well marked. × 6.

Fig. 3. Two of the small conical gastric teeth from the anterior portion of the first triturating stomach. × 6.

Fig. 4. *a*, one of the more compressed gastric teeth from the front part of the first triturating stomach; *b*, the same tooth from above. × 6.

Fig. 5. One of the largest gastric teeth seen from the side and below. × 6.

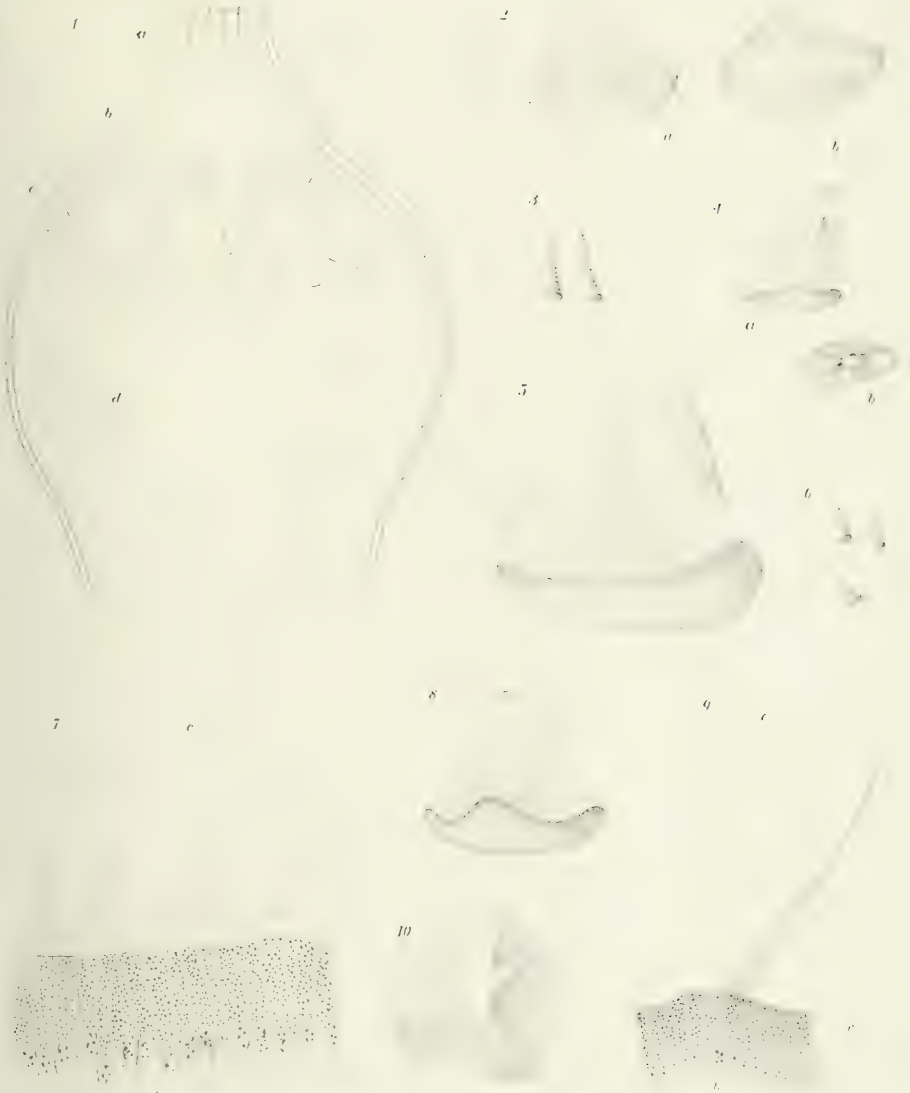
Fig. 6. Three of the numerous small conical teeth characteristic of the second triturating stomach. × 6.

Fig. 7. Epithelium-cells from just beyond the base of the palatal fold on the dorsal side of the buccal cavity. Drop-like secretion products are seen passing out from the distal ends of the cells and gradually merging into the common cuticle; *c*, outer border of the cuticle. × 500.

Fig. 8. A medium sized gastric tooth from the first triturating stomach in side view. × 6.

Fig. 9. A slender palatal spine from the basal region of the palatal fold; *c*, epithelium; *c*, surface of cuticle; *b*, basal or matrix-cell of the spine. × 6.

Fig. 10. The gastric tooth of Fig. 8 above, but here shown in surface view. × 6.


1
a
b
c
d
2
a
b
3
4
a
b
5
6
7
c
8
9
c
10

BINDING SECT. JUN 6 1968

QL
1
H35
v.35

Harvard University. Museum of Comparative Zoology
Memoirs

Biological
& Medical
Serials

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

STORAGE